SEPTEMBER
1 9 6 0

FOUNDRY

A PENTON PUBLICATION

▷ How To Form Unlined Passages in Castings Page 98

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New Ferrocarbo Briquettes are the only cupola deoxidizers containing an expanding agent, a catalyst and a slag activator. Ferrocarbo Briquettes enable progressive foundrymen to obtain castings that are stronger, denser and more easily machinable. In addition, the use of Ferrocarbo® promotes more thorough deoxidation, improved fluidity, greater silicon efficiency, reduced sulfur, better manganese recovery, fewer scrapped castings.

CARBORUNDUM

Ferrocarbo® distributors are Kerchner, Marshall & Company; Pittsburgh, Buffalo, Detroit, Philadelphia, Birmingham, Los Angeles, Canada.
Miller and Company; Chicago, St. Louis, Cincinnati, Kansas City, Mo., Burlington, Iowa.

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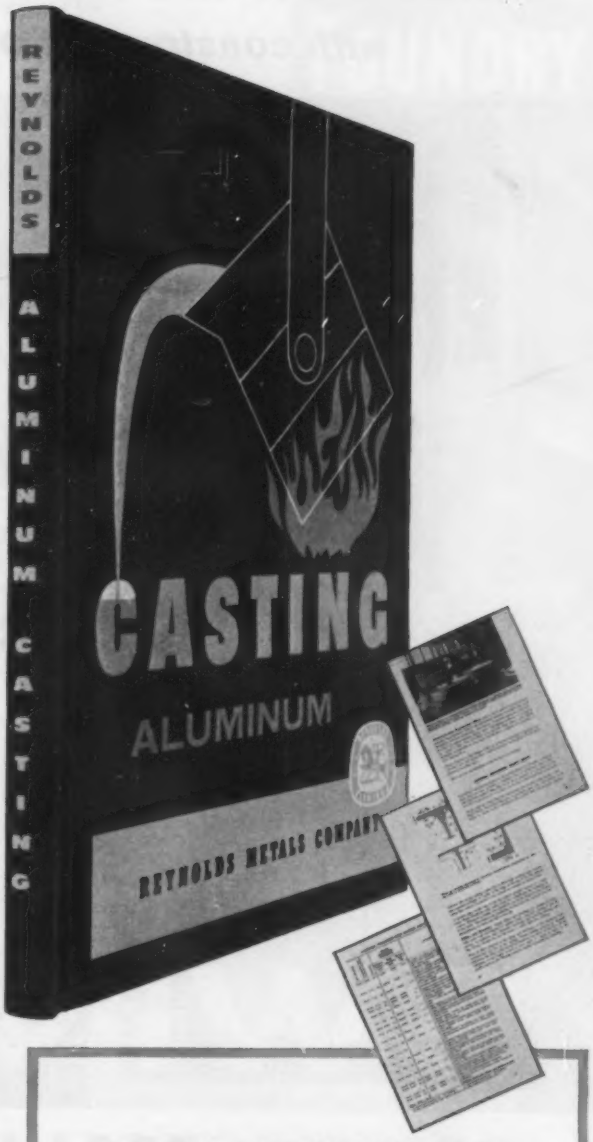
128 PAGES OF FACTS TO ANSWER YOUR QUESTIONS ON CASTING ALUMINUM



Casting Aluminum is a highly informative manual published by the Reynolds Metals Company. It's available—free—to everyone concerned with casting. Hard cloth-cover bound, and profusely illustrated with photographs and diagrams, *Casting Aluminum* is a valuable asset to every technical library.

Get fast delivery on aluminum pig and ingot . . . contact your local Reynolds sales office for the name of the Reynolds Pig and Ingot Distributor in your area.

The amazing growth of aluminum makes understanding aluminum and its potentials doubly important—and this new book can help you realize just how you can do a better job with aluminum.

For your copy of the new Reynolds manual, *Casting Aluminum*, write to *Reynolds Metals Company, Box 2346FK, Richmond 18, Virginia.*

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Effects of Alloying Elements
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Defects, Quality Control and Salvage

REYNOLDS ALUMINUM

Watch Reynolds new TV show "Harrigan & Son", Fridays, starting October 7; also, "All Star Golf", Saturdays, resuming October 15—ABC-TV. And on Sunday, October 16, be sure to see the exclusive showing of America's new 1961 cars on The National Automobile Show, direct from Detroit over CBS-TV, 6 to 7 P.M. EDST.

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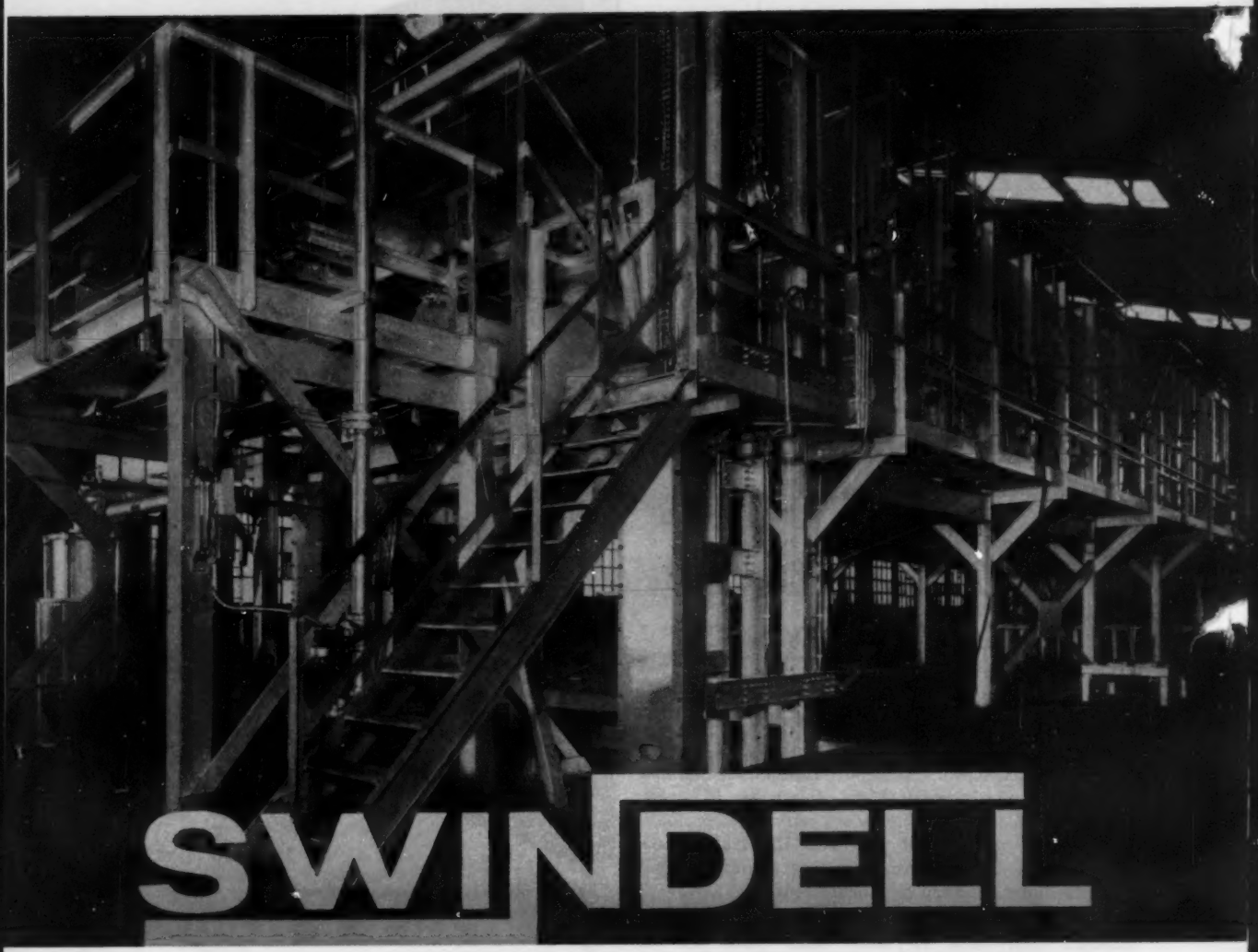
BUILT FOR MODERN FOUNDRY NEEDS

with construction of steel mill grade!



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Built for the specific firing cycles required by foundry malleableizing and ductile iron production schedules, with extremely precise control of temperatures, SWINDELL Malleableizing Furnaces are outstanding in construction quality . . . heavy construction for long service life . . . tight construction to support close atmospheric control . . . elevated construction to conserve valuable floor space. Let a Swindell engineer sit down with you and relate these advantages to your particular requirements—write, without obligation.

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This four-blade turbine runner was cast in one piece by Bethlehem Steel Co. at its Bethlehem, Pa., foundry for Allis-Chalmers. Weighing 18 tons and measuring 14 ft in diam, its blades will be fitted with stainless steel tips. It is destined for a Georgia Power Co. project.

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Volume 88—Number 9

FOUNDRY
A PENTON PUBLICATION

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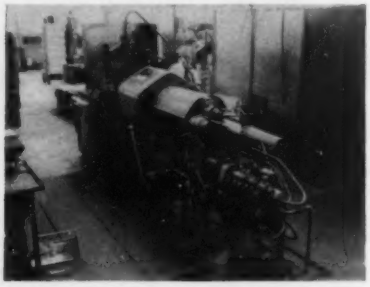
THE EDITORS' WORKSHOP

SHELL CORES: Adoption of resin-bonded sand for cores has accelerated in recent years and has become more widespread than the

use of this type of sand for shell molds.

Reasons for the rising popularity will be discussed in a group of articles to be presented next month.

EUROPEAN DIECASTING: For a look at how European diecasting practices differ from those of this country—and there are some radical differences—see an informative report on this subject in the October issue. It represents the views of some 40 members of the Society of Die Casting Engineers who toured numerous plants while in Europe for the Third International Pressure Die Casting Conference in Stresa, Italy. One of the interesting machines inspected by the



group was the automatic zinc diecasting unit shown above. It has a capacity of 1600 shots an hour.

The report was compiled by John L. MacLaren, Aluminium Ltd. Sales Inc., Detroit, chairman of the first National Die Casting Exposition and Congress, to be held in Detroit, Nov. 8-11.

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. . . Fluid Power news

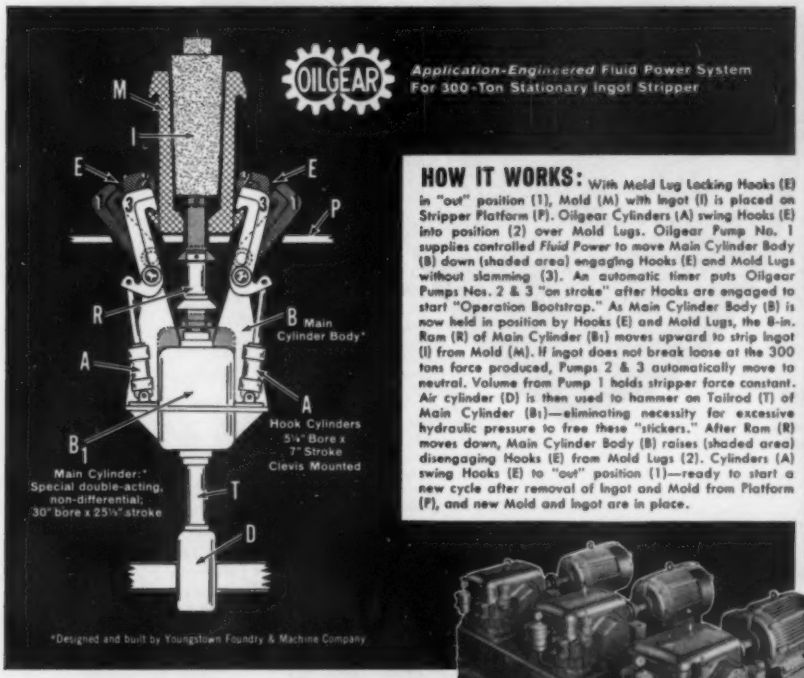
REPORT NO. 11,804 OILGEAR POWERED INGOT STRIPPER

From Oilgear *Application-Engineering* Files

HOW OILGEAR HEAVY-DUTY SYSTEM SIMPLIFIES POWER AND CONTROL OF 300-TON STATIONARY INGOT STRIPPER—HELPS ELIMINATE MAINTENANCE DOWNTIME

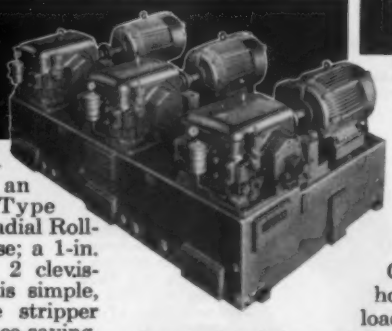
DATA: To replace a mechanical-type ingot stripper because of considerable maintenance downtime caused by dirt and foreign particles jamming the motor-driven ram screw—necessitating disassembly of the entire mechanism to free the threads. A hydraulically-powered, floor-mounted stripper design was approved as most convenient for the big-end-up molds used in this particular operation—would provide faster, easier maintenance accessibility at lowest over-all initial replacement cost.

Basic Power and Control Requirements: 1. Simplicity, and trouble-free, rugged dependability. 2. To be capable of many years of heavy-duty, rapid, 'round-the-clock operation with an absolute minimum of maintenance. 3. Must be: impervious to sand, scale, heat; compact; thrifty on electrical power input, wiring, installation downtime, floor space; completely free, if possible, from maintenance-provoking belts, chains, relays. 4. One source and responsibility for power and control systems preferred.



HOW IT WORKS: With Mold Lug Locking Hooks (E) in "out" position (1), Mold (M) with Ingot (I) is placed on Stripper Platform (P). Oilgear Cylinders (A) swing Hooks (E) into position (2) over Mold Lugs. Oilgear Pump No. 1 supplies controlled *Fluid Power* to move Main Cylinder Body (B) down (shaded area) engaging Hooks (E) and Mold Lugs without slamming (3). An automatic timer puts Oilgear Pumps Nos. 2 & 3 "on stroke" after Hooks are engaged to start "Operation Bootstrap." As Main Cylinder Body (B) is now held in position by Hooks (E) and Mold Lugs, the 8-in. Ram (R) of Main Cylinder (B_1) moves upward to strip Ingot (I) from Mold (M). If ingot does not break loose at the 300 tons force produced, Pumps 2 & 3 automatically move to neutral. Volume from Pump 1 holds stripper force constant. Air cylinder (D) is then used to hammer on Tailrod (T) of Main Cylinder (B_1)—eliminating necessity for excessive hydraulic pressure to free these "stickers." After Ram (R) moves down, Main Cylinder Body (B) raises (shaded area) disengaging Hooks (E) from Mold Lugs (2). Cylinders (A) swing Hooks (E) to "out" position (1)—ready to start a new cycle after removal of Ingot and Mold from Platform (P), and new Mold and Ingot are in place.

ABOVE: Oilgear-equipped Ingot Stripper "in action"—Mold Lug Locking Hooks (E) indicated. A 10,000-lb. ingot has just been "stripped" from the mold. Hooks (E) will be disengaged as soon as stripper ram is retracted.



LEFT: Oilgear Heavy-Duty "Power-Pak"—consisting of 3 Oilgear Type "DX-60" Variable Displacement, Two-Way Pumps on a single reservoir base used on this installation—is remotely located, isolated from heat and gritty particles present in the stripping area.

SOLUTION: An *Oilgear Application-Engineered Heavy-Duty System* consisting of an Oilgear "*Power-Pak*" incorporating 3 Type "DX-60" Variable Displacement, 2-Way, Radial Rolling Piston Pumps on a single reservoir base; a 1-in. solenoid-pilot-operated 4-Way Valve; and 2 clevis-mounted Hook Cylinders (A, above). This simple, direct-acting, locked-circuit, push-up-type stripper with remote speed and cycle control . . . space-saving, remotely located "*Power-Paks*" . . . automatic pressure and flood lubrication with continuously filtered power fluid . . . positive, automatic overload protection—has eliminated maintenance downtime problems encountered with the previous mechanical stripper. Long life for continuous, 'round-the-clock production is assured by this automatic, "*Sealed-System*"—aided by the direct application of the pneumatic jarring cylinder to free "frozen" ingots. Lower installation cost, faster—easier accessibility for preventive maintenance are but two additional advantages of this Oilgear-equipped ingot stripper. USER STATES—"*Oilgear was selected because of its simplicity, and the trouble-free, long-life performance record of other Oilgear-equipped machines in our plants.*"

With Oilgear Heavy-Duty System Components designed for thousands of hours of continuous service at full rated load, savings are compounded with every hour of uninterrupted performance. That's why machinery and equipment manufacturers and *their* customers say . . . **"for the lowest cost per year . . . it's Oilgear!"**

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Coreroom Foreman,
BYRON JACKSON FOUNDRY DIVISION, BORG-WARNER CORPORATION
Lawrenceburg, Indiana

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PAUL WILSON,
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FRANK FOUNDRIES CORP.,
Muncie, Indiana

"I run the core room in the Muncie Foundry . . . turn out 60 tons of cores a day. They range from little ram-up jobs to 17-piece assemblies for transmission cases. It's a real headache if the core oil acts up . . . makes the difference between profit and loss. For a reliable oil . . . I'm sold on **LINOIL.**"

JOHN WHITE,
Core Foreman,
STRAIGHT LINE FOUNDRY & MACHINE COMPANY,
Syracuse, New York

"We've mixed 5998 batches of **LIN-O-SET** bonded core sand and I've scrapped only thirteen! Some of our biggest cores take 22 batches. Our working time is 30 to 45 minutes."

care how they part their hair..."

"We deal with ADM because they offer products and services that help us make better castings at less cost"

AL FLOYD,
Assistant Core Superintendent,
GOLDEN FOUNDRY COMPANY,
Columbus, Indiana

"Quality control on intricate water-jacket cores like these demands the added insurance of **LINOIL**. We can't take a chance on cheap binders. **LINOIL** helps us hold core scrap on heads and jackets to 2.06%."

KEN ARMSTRONG,
Molding Foreman,
KOEHRING COMPANY,
Milwaukee, Wisconsin

"We're our own toughest customer when it comes to smooth finishes and tight tolerances on the cable drums for our Hevi-Duty cranes. **GREEN BOND BENTONITE** prevents mold wall movement. **CROWN HILL SEA COAL** gives the peel I need for extra-smooth finish."

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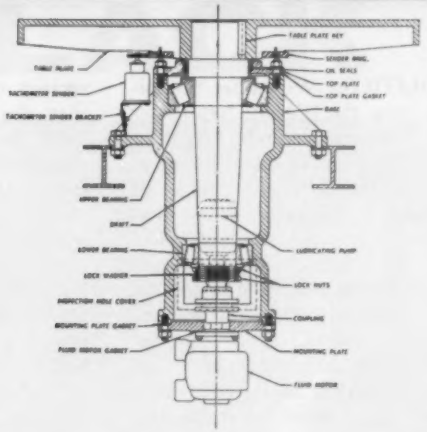

Vertical Hydro-Centrifugal Casting Machine

This particular Herman machine provides foundrymen with the required amount of dependable production, because of hydraulic powering.

It offers modern casting production by the centrifugal method, and is another example of the Herman Company's ability to engineer molding machines for all requirements.

Here are a few reasons why it is widely used:

A. Machines controlled and operated entirely by hydraulic power.

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D. Tachometer indicates actual r.p.m. of table plate.

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F. Table spindle connected directly to fluid motor.

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I. Power unit remotely installed, insuring protection from operation hazards.

J. Flow and volume of oil automatically controlled providing overload protection.

K. Instantaneous setting of rotative speed by dial control flow valve.

L. All wearing parts completely enclosed, providing protection from foreign matter.

Further information on the Herman Vertical Hydro-Centrifugal Casting Machine, or any other of our complete line of molding equipment, can be supplied by our nearby Sales Engineer.

Or, write the address below.

Catalog on request.

2140-HP

HERMAN PNEUMATIC MACHINE CO.
UNION BANK BUILDING, PITTSBURGH 22, PA.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

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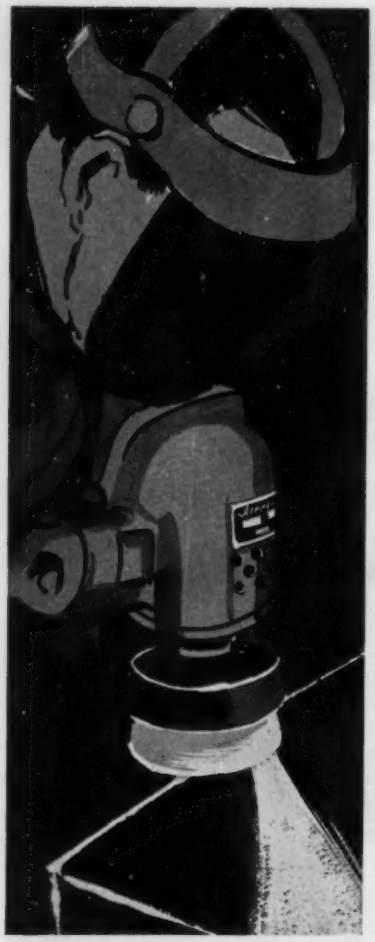

New AIRETOOL MOTOR *muffles* grinding noises . . .

. . . for better working conditions
. . . for greater production

Airetool's new muffled motor cuts nerve-tearing exhaust noise to a minimum; improves morale and workmanship; boosts productivity. Muffled motors are available on Airetool Vertical Grinder Models 600 VM and 700 VM for cup and depressed wheel grinding, sanding and wire wheel work.

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With the Editors

IN POLITICS: We gather the following from the *Weekly Newsletter* of the National Foundry Association: "We know of many foundrymen who are active in politics at various levels, but rarely do we find one serving on the judiciary. Recently, we read of the American Bar Association awarding a citation to Birmingham (Mich.) Municipal Court Judge John C. Emery and Associate Judge Edward Emery, for their court having made the greatest annual improvement in traffic law administration among cities in the 25,000 to 50,000 population class.

"The Emerys are, respectively, president and secretary, Racine Foundry & Manufacturing Co., Detroit. They guarantee no special treatment for foundrymen speeding through their fair city."

Diamond Anniversary: This year the C. O. Bartlett & Snow Co., Cleveland, is celebrating the 75th anniversary of its founding. During that period, the company has served a wide variety of industries, producing equipment for handling and processing bulk materials for the foundry, steel, coal, chemical, grain, and food processing industries. The illustration below shows a Bartlett-Snow float in an 1895 industrial parade.

In marking the diamond anniversary, company officials point out that the firm's growth from the hand dressing of stone wheels for the milling of grain in 1885 to present installations representing millions of dollars in specially designed equipment can be attributed to an underlying policy of carefully analyzing the specific needs of the customer, then translating them into proper design and selection of the best suited equipment.

The company became one of the pioneers in the mechanization of foundries in 1910 and during the ensuing years has contributed to progress in the metal castings industry. Today, C. O. Bartlett & Snow Co. serves an international market for the components it designs and fabricates for handling sand, flasks, molds, castings, and bulk materials.

Congratulations to a fine company for so many years of service to the foundry and other industries.

A Citation: Our congratulations to Wyndam R. Bean on receiving on June 12 a citation from Virginia Polytechnic Institute, Blacksburg, Va., for meritorious service and outstanding contribution to his profession, to his nation, and to his alma mater.

Wyndam Bean, a retired vice president of the Whiting Corp., lives on the beautiful Elwyn Farm a few

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- H-W Black Patch makes a joint-free monolithic lining of very high refractoriness.
- H-W Black Patch develops a strong ceramic set upon heating and is exceedingly resistant to erosion.
- H-W Black Patch is not wetted by molten iron and is not appreciably penetrated by slag and metal.
- H-W Black Patch is highly resistant to thermal shock and oxidation.
- H-W Black Patch is easy to use by air- or hand-ramming to any desired shape.

Other important applications in which H-W BLACK PATCH renders unusual service for cupola requirements are breast walls, tap and slag holes, spouts and runners.

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HARBISON-WALKER REFRACTORIES
FOR THE FOUNDRY INDUSTRY

World's Most Complete Refractories Service

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General Offices: Pittsburgh 22, Pennsylvania

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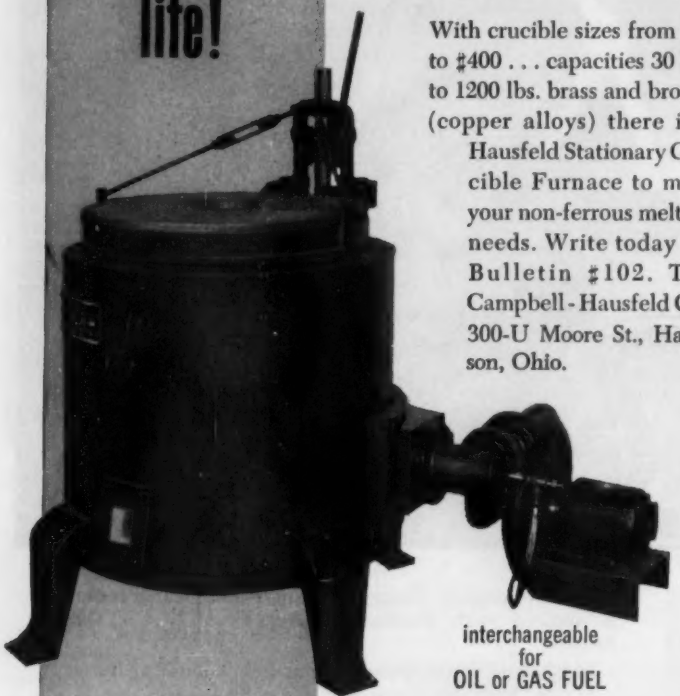
Engineered for longer crucible life!

■ In the Oil Fuel models, as shown, the special higher-pressure mechanical atomizing oil spray—a Hausfeld exclusive – produces a clear, hot flame with minimum cutting action . . . *increases* crucible and lining life.

■ Well insulated lining assures uniform heat dispersal – cuts heat loss and assures many years of fast, efficient melting of brass and bronze.

With crucible sizes from #10 to #400 . . . capacities 30 lbs. to 1200 lbs. brass and bronze (copper alloys) there is a Hausfeld Stationary Crucible Furnace to meet your non-ferrous melting needs. Write today for Bulletin #102. The Campbell-Hausfeld Co., 300-U Moore St., Harrison, Ohio.



interchangeable for OIL or GAS FUEL

Hausfeld STATIONARY CRUCIBLE FURNACES

CAMPBELL-HAUSFELD
METAL MELTING FURNACES

miles outside Staunton, Va. Prior to his foundry equipment affiliation, he was connected with the malleable industry for many years. He is the oldest living past president of AFS, having served two terms from 1920 to 1922.

I first became well acquainted with him in the early days of World War II, when he took over for me the problem of chief, Foundry Equipment and Supplies Section, War Production Board. He is a wonderful gentleman.

Come on Tenderfeet!: When the folks from the West Coast arrived in Philadelphia for the AFS convention and show, everybody around the hotels and the exhibition knew they were in town. These westerners, and there was an ex-

ceptionally large delegation of them for an eastern show, came marked.

Each one wore a cast aluminum badge 3 in. in diameter which had been treated to a beautiful golden color in honor of San Francisco's Golden Gate bridge. The badge told everyone that it was San Francisco in '61 for the AFS.

The badges (see illustration) were cast by the Pacific Brass Foundry of San Francisco Inc., 251 Second St., San Francisco. Our compliments on a good job.

But badges did not represent all of the promotion of the folks from San Francisco, and points north and south. Everyone from way out there was extending a cordial invitation to everyone else to visit San Francisco May 8-12, 1961 to see a limited foundry show, participate in activities of the AFS Congress, and partake of the wonders of one of America's most beautiful and unusual cities. A good time was promised at every turn.

We can hardly wait!

F.G.S.

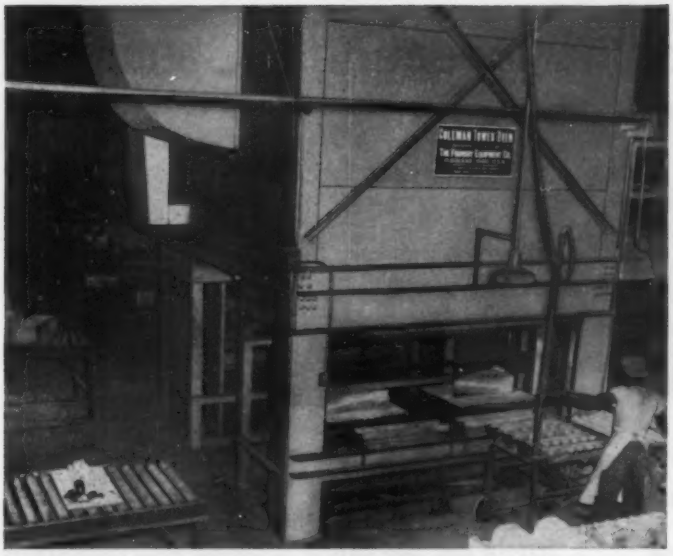
Circle 561 on Page 55

CUT LABOR COSTS

with

Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.

Coleman Conveyor Core Ovens



Coleman Tower® Core Oven. One of two large installations in a major steel foundry. Mechanized handling and baking of cores up to 150 pounds at substantial annual savings.

● **Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%!**

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

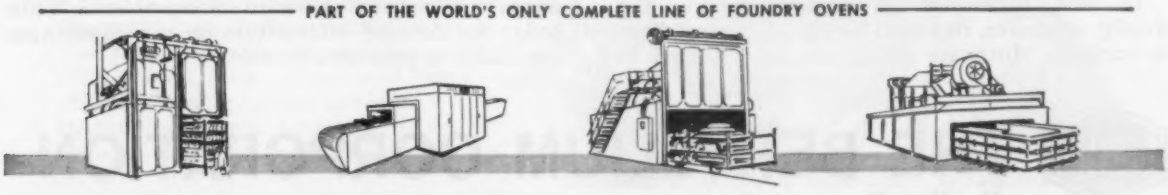
WRITE FOR BULLETIN 54

FEMA

THE FOUNDRY EQUIPMENT COMPANY • 1821 COLUMBUS ROAD, CLEVELAND 13, OHIO

World's Oldest and Largest Foundry Oven Specialists—More than half a century of specialized foundry experience.

PART OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS

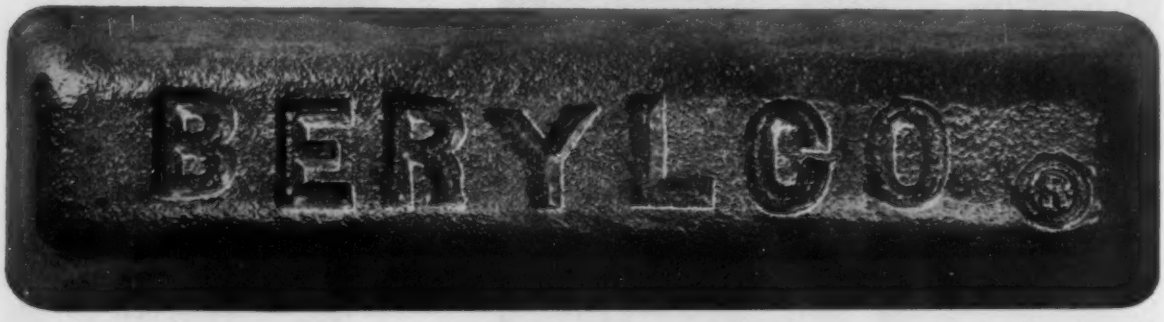


TRANSRACK OVENS | DIELECTRIC CORE OVENS | CAR TYPE OVENS | JET ACTION MOLD OVENS

Circle 562 on Page 55

BERYLCO Beryllium Copper Alloys

For Sand, Pressure and Investment Castings



Hard as Steel, With Fine Fluidity, Detail, Castability and Ease of Handling

BERYLCO casting alloys offer you a combination of properties, not just outstanding, but actually unique. The strength of steel, the electrical conductivity of copper, high resistance to corrosion and wear . . . all these and other characteristics become part of the casting . . . without creating problems for the foundryman.

In sand, investment or pressure casting, the fluidity of molten BERYLCO beryllium copper alloys is excellent. Intricate detail can be obtained in parts "as cast". Low pouring temperature and castability provide distinct foundry advantages over ferrous and non-ferrous materials with comparable physical and mechanical properties.

At BERYLCO, we maintain a complete organization of specialists available to you for technical information and assistance in any phase of beryllium copper casting. These service aides are experienced men who know foundries and come prepared to solve problems. BERYLCO beryllium copper casting alloys have been developed to solve problems. Write today for detailed information on the advantages applicable in your own foundry.

BERYLCO®

THE BERYLLIUM CORPORATION

Reading, Pennsylvania

Circle 715 on Page 55

Every Worker
breathes easily when He Wears the AO "RED DEVIL" Respirator

NOTE: The Red Devil filter is *red* in color and is an American Optical exclusive. Available in package of 5 or 50.

Workers like the equipment because it's so easy to breathe through. The compact, variable density Red Devil filter is extremely efficient. Safety directors find that their safety budget dollars stretch farther because the respirator has a built-in pre-filter which lengthens service life.

The Red Devil illustrated is one of AO's inventory-reducing R2000 Series Single Filter Respirators offering 9 types of protection with one basic face piece. The R2090 Red Devil Respirator is approved by the Bureau of Mines for all dusts not significantly more toxic than lead, pneumoconiosis-producing mists and chromic acid mist.

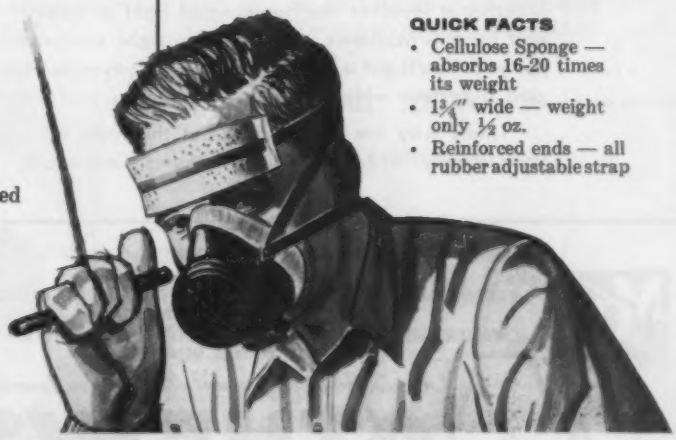
American Optical COMPANY
SAFETY PRODUCTS DIVISION

Safety Service Centers in Principal Cities
Always insist on Trade-marked Safety Products

AO SWEATBANDS...
"TREMENDOUS TRIFLES" that

- Help Prevent Accidents
- Add to Production Efficiency

AO Sweatbands keep workers cooler, more efficient . . . keep sweat out of eyes and off safety lenses. Prevent accidents due to blurred vision and stop foreign matter from being carried into eyes — thereby reducing eye dispensary cases. Features adjustable head strap. Several models available — 109B (shown), 108B—1" wide and "wrap around" types for helmets and face shields. Your nearest AO Safety Products Representative can supply you.

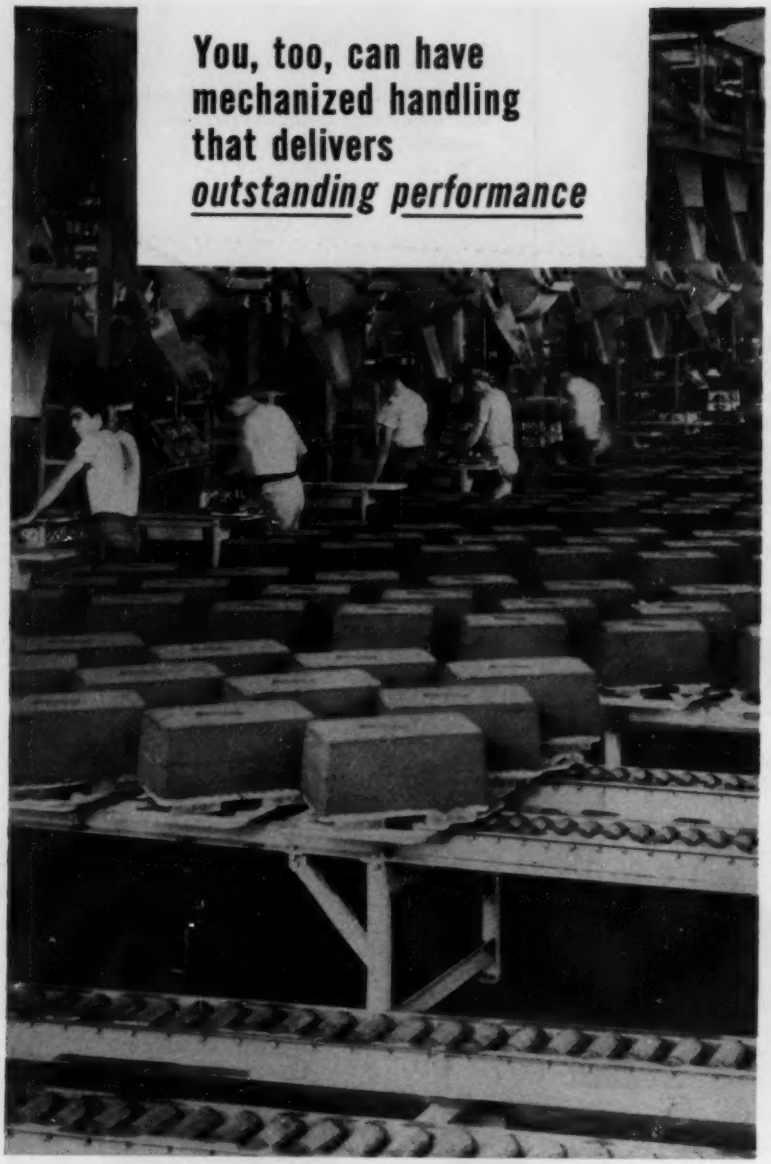


QUICK FACTS

- Cellulose Sponge — absorbs 16-20 times its weight
- 1¾" wide — weight only ½ oz.
- Reinforced ends — all rubber adjustable strap

BE SAFE FOR SURE — WITH AO SUREGUARD PROTECTIVE EQUIPMENT

Circle 563 on Page 55



You, too, can have mechanized handling that delivers *outstanding performance*

• Whatever your conveying problem might be — whether it involves the handling of light or heavy unit loads — Mathews will build the **right** equipment for you. You'll get a fully integrated conveyer service, and a system which delivers outstanding performance.

That's why we believe you get the most for your money when you buy Mathews Conveyers.

GENERAL OFFICES ..... MATHEWS CONVEYER COMPANY
Ellwood City, Pennsylvania

WESTERN DIVISION ..... MATHEWS CONVEYER COMPANY WEST COAST
San Carlos, California

CANADIAN DIVISION ..... MATHEWS CONVEYER COMPANY, LTD.
Port Hope, Ontario, Canada

(Member Foundry Equipment Manufacturers Association)

MATHEWS

CALENDAR of Meetings

Sept. 6-16—The Machine Tool Exposition—1960, International Amphitheatre, Chicago.

Sept. 6-16 — Production Engineering Show, Navy Pier, Chicago.

Sept. 14-15—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 18-20—Steel Founders' Society, fall meeting, Homestead, Hot Springs, Va.

Sept. 19-24—International Foundry Congress, Zurich, Switzerland.

Sept. 22-23—National Foundry Association, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 26-28—Standards Engineers Society, annual meeting, Hilton Hotel, Pittsburgh.

Sept. 26-29—American Welding Society, fall meeting, Hotel Penn-Sheraton, Pittsburgh.

Sept. 26-30—Instrument Society of America, fall Instrument-Automation Conference and Exhibit and annual meeting, Coliseum, New York.

Sept. 27-30—Association of Iron & Steel Engineers, Iron & Steel Convention and Exposition, Public Auditorium, Cleveland.

Oct. 12—Cast Bronze Bearing Institute, annual meeting, Grove Park Inn, Asheville, N. C.

Oct. 12-14—Gray Iron Founders' Society, annual meeting, Netherland Hilton Hotel, Cincinnati.

Oct. 13-15—Non-Ferrous Founders' Society, annual meeting, Grove Park Inn, Asheville, N. C.

Oct. 14-15—New England Regional Foundry Conference, Kresge Memorial Auditorium, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 17-18—American Coke and Coal Chemicals Institute, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18—Magnesium Association, annual convention, Pick Carter Hotel, Cleveland.

Oct. 17-21—American Society for Metals, National Metal Exposition & Congress, Trade and Convention Center, Philadelphia.

Oct. 17-21—National Safety Council, annual safety congress, Conrad Hilton Hotel, Chicago.

Oct. 19-21—Society for Experimental Stress Analysis, annual meeting, Hotel Claremont, Berkeley, Calif.

Oct. 20-22—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 21-22—Northwest Regional Conference, Vancouver, B. C.

Oct. 22-25—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 27-28—Purdue Metals Casting Conference, Purdue University, Lafayette, Ind.

Oct. 27-28—All-Canadian Regional Foundry Conference, Mt. Royal Hotel, Montreal, Que.

Nov. 1-3—Material Handling Institute Inc., Central States Show, Kentucky Fair and Exposition Center, Louisville.

Nov. 2-3—Investment Casting Institute, annual meeting, North Park Hotel, Chicago.

Nov. 3-4—Michigan Regional Foundry Conference, Bancroft Hotel, Saginaw, Mich.

Nov. 8-11—Society of Die Casting Engineers, First National Die Casting Exposition & Congress, Detroit Artillery Armory, Detroit.

Nov. 14-16—Steel Founders' Society, Technical and Operating Conference, Pick Carter Hotel, Cleveland.

Nov. 30 - Dec. 2 — Metallurgical Society of AIME, Electric Steel Conference, Morrison Hotel, Chicago.

1961

Feb. 26-Mar. 2—American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, St. Louis.

March 11-14—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

March 20-24—American Society for Metals, Western Metal Show, Pan-Pacific Auditorium, Los Angeles.

April 18-20—Foundry Educational Foundation, annual college-industry conference, Hotel Statler, Cleveland.

May 8-12—American Foundrymen's Society, Castings Congress & Exposition, San Francisco.

Circle 564 on Page 55

NO OTHER CO_2 BINDER COMES UP TO STEINEX

The Original CO_2 Binder . . .
Available only from **CARVER**

BEST QUALITY

Steinex gives you absolutely the best shakeout — BY FAR!

BEST PRICE

30% lower in cost than any other binder on the market!

BEST SERVICE

No one can give you more in-the-foundry experience and know-how than CARVER!

AND FOR BETTER CORES

KRAUSS Self-Cleaning Taper Slot CORE VENTS

Krauss Core Vents are knurled on sides to assure greater gripping power.
Underface — reinforcing rings prevent slots from closing when core vents are hammered into place.

MAIL TODAY

F-7

CARVER FOUNDRY PRODUCTS
Muscatine, Iowa

Please rush information and prices on:

- ☐ Steinex CO_2 Binders
- ☐ Krauss Self-Cleaning Taper Slot Core Vents

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

Circle 565 on Page 55

(Advertisement)

In automated foundry molding systems . . .

"BARGAIN" QUOTATIONS CAN BE SUCKER BAIT!

Initial equipment costs are only part of total expense. Long-term savings in installation, operating, maintenance and labor costs provide the real pay-out in automated systems. And the prime factor behind these savings is the blending of creative engineering and advanced equipment designs into "packaged" systems.

Before you sign an order for any integrated molding system on the basis of "price" alone, read the small print in the quotation. Be sure what the equipment manufacturer really will supply for a stated sum. And, by all means, evaluate the specific design and operating features of all component equipment to be used in your custom-engineered system.

Beware of "Hidden" Costs

If you do look beyond price, as you must in your own best interests, an apparent "bargain" proposal may involve substantial secondary costs for the installation and wiring of equipment by sub-contractors. Also, are you assured of installation supervision by factory-trained service engineers?

Dead Space Is A Luxury

Other hidden cost factors in automated molding techniques are the "dead" areas . . . extra empty flasks required to make a system operate, valuable plant space consumed by obsolete cooling methods and superfluous transfer conveyors, the lack of capability for system modification or expansion to meet future requirements. When you consider these cost-boosting factors, it is easy to understand why a poorly designed or engineered system is a luxury that profit conscious long-range planners cannot afford.

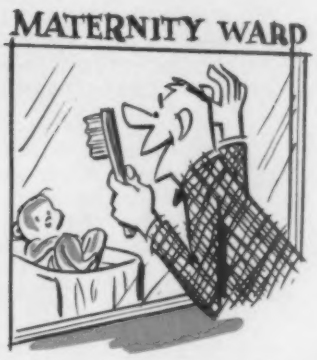
Ready-To-Install Packages

As the world's largest supplier of foundry molding equipment, SPO Incorporated has designed, engineered and built a variety

of automated high-production systems . . . *and supplied them as integrated packages ready for installation and operation.* Many of these systems have been custom-engineered from standardized components.

Savings Can Be Built-In

A recent installation illustrates the savings that SPO pre-engineers into its systems concepts. Bidding competitively, SPO quoted a complex major system on a "package" basis. SPO's firm quote appeared to be high. But . . . the SPO system design (1) required 17% fewer flask sets to meet production specifications... a design saving of 2% on the programmed Gross cost . . . and (2) provided integrated and installed wiring systems requiring only connection to plant power lines . . . a secondary saving of 3% on the Gross through reduction of outside contractor costs. RESULT: *installed cost of the SPOMATIC system actually was less than the over-all cost involved with lower quoted competitive equipment.* And SPO's integrated components assured maximum ease of installation . . . another savings in time, labor and materials.



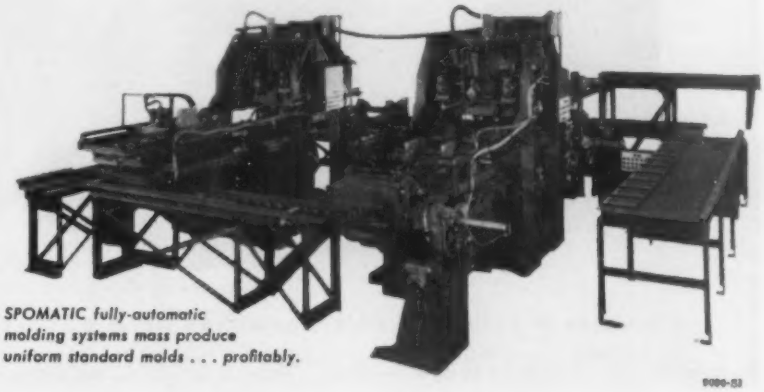
Maintenance Must Be Pre-Planned

Because periodic maintenance and replacement are inherent in foundry molding equipment, SPO has created modular equipment designs that permit quick removal of complete sub-assemblies for servicing or repair. And to minimize down-time, fully interchangeable replacement parts or sub-assemblies can be installed immediately.

Proven Experience Pays Off

SPO is best qualified to help you analyze and solve molding problems because no other company has as many "tailored" automatic systems in operation today . . . or broader experience in advanced molding methods. *Write . . . or call DIamond 1-3666 . . . for additional information.*

SPO INCORPORATED, 6449 Grand Division Ave., Cleveland 25, Ohio.



SPOMATIC fully-automatic molding systems mass produce uniform standard molds . . . profitably.

9000-53

Circle 566 on Page 55

ever hear of the Cleco

"quality control package"?

"Quality Control Package" is the term we use to describe our method of designing, manufacturing, and servicing air tools. Too, we think this term best describes what Cleco offers you. Outstanding tools, engineering assistance, and service directed towards helping you increase the quality of your products with greater speed and economy.

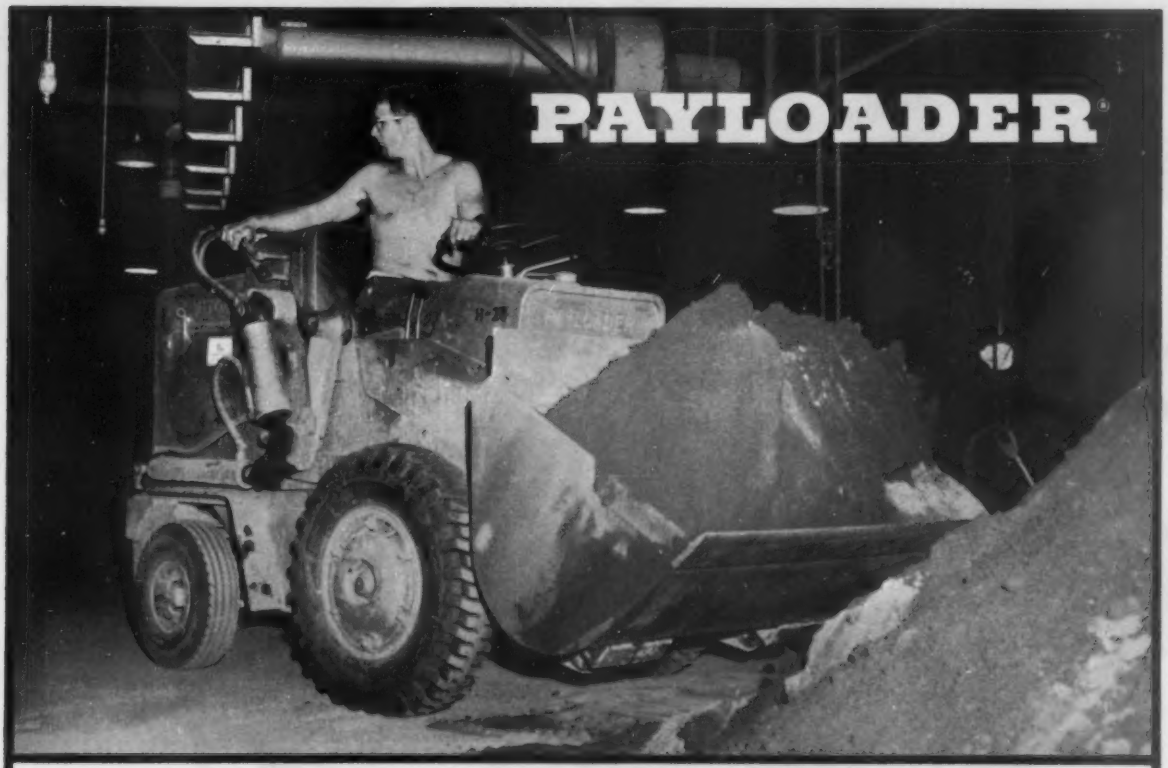
Built-in quality is a vital part of the Cleco "Quality Control Package." Cleco air tool designs are never finalized until their value has been proved on customer operations. In the production phase, our roving specialists perform 100% surprise inspections at all critical points. Each and every completed tool is tested in a sound-proof room . . . checked against engineering specifications for power, air consumption, and speed. Appearance, too. **From Cleco® you get quality all the way.**

CLECO
AIR TOOLS

"quality tools engineered for industrial progress"

A Division of REED ROLLER BIT COMPANY • P. O. BOX 2119 • HOUSTON 1, TEXAS, U.S.A.

IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Leaside (Toronto), Ontario



What users say about the H-25..

The success of the H-25 "PAYLOADER" can best be gauged by what owners and operators of this tractor-shovel say about it. Here are typical comments from users in foundry, chemical, ceramic, paper, and other industries.

Power and Capacity: "Gives nearly twice the production of our old HA's . . . good digging power and traction, fast lifting power. The most efficient we've ever used — outperforming larger loaders." "Before purchasing the H-25 we had competitive demonstrations that proved its production efficiency over other machines."

Speed and Maneuverability: "Is quicker on the lift, dump and go than the . . . . . — is more compact . . . gets into smaller places easier and faster." "Is doing a top production job. Power-steer and power-shift combination gives us maximum efficiency from both the machine and the operator."

Easy Operation: "The H-25 is a dandy with its power-steer and power-shift — gets full loads without spinning wheels and the operator lasts longer too." "I like the maneuverability and work capacity."

Reliable: "We find they stand up under tough rugged duty with minimum repairs." "The low maintenance on the H-25's has been way superior to any loader previously used. It's a real producer, easy to service." "Gives maximum production output under ideal *or* adverse conditions."

The satisfaction being delivered by the 2500-lb. capacity model H-25 is a reflection of the kind of performance built into *all* "PAYLOADER" units. There are 20 models in 8 capacity ranges — up to 12,000 lbs. operating capacity — to meet your needs, and a nearby HOUGH Distributor to serve you. He has the finest parts and service facilities, backed by factory service personnel to keep your "PAYLOADER" investment profitable.

HOUGH®

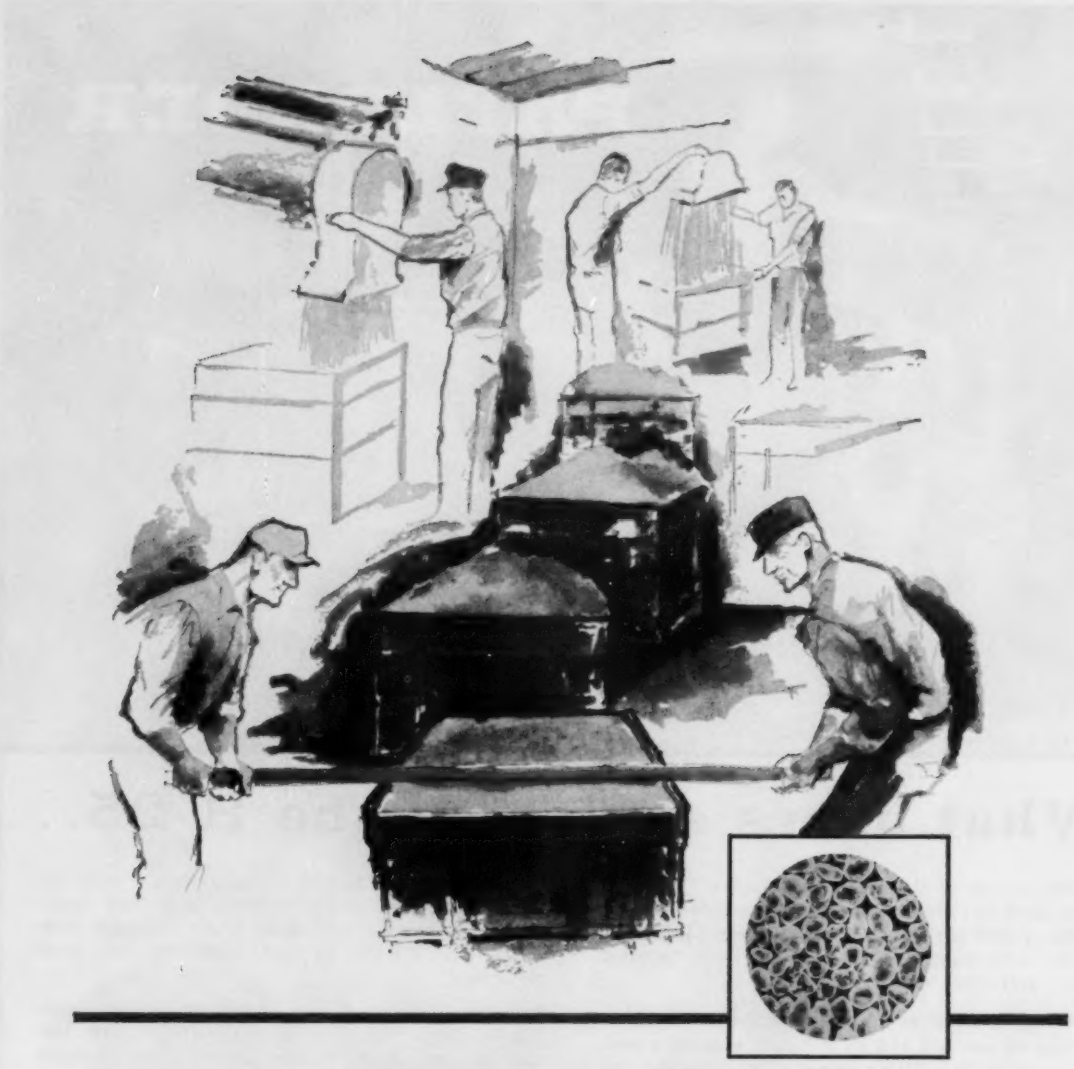
THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO.
703 Sunnyside Ave., Libertyville, Illinois

_____ Send "Industrial Materials Handling the 'PAYLOADER' Way"

Name _____
Title _____
Company _____
Street _____
City _____ State _____

9-A-3



ALL THE MERITS OF ROUNDED-GRAIN QUALITY ARE YOURS WITH WEDRON SILICA...

New casting techniques produce more accurate castings that require less machining. This is the new money-saving dimension in industry that demands finer foundry sands. Wedron's pure rounded-grain is the answer, in case after case where other sands fail. Where accuracy is demanded, Wedron Silica can meet all specifications and give outstanding results. Make your next order pure, uniform rounded-grain sand from Wedron.

WEDRON SILICA COMPANY

135 South LaSalle Street • Chicago 3, Illinois

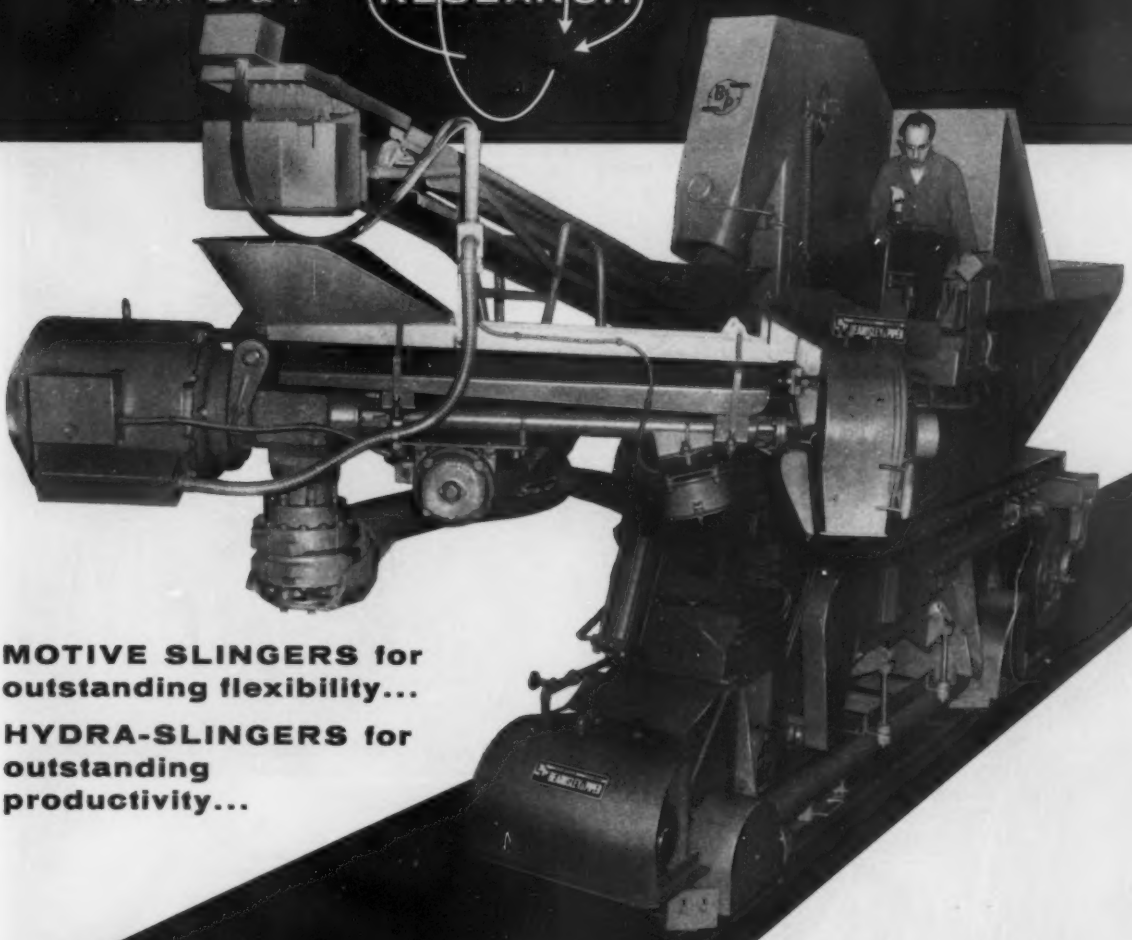
Send for illustrated brochure on Wedron sands.

99.9% PURE SILICA WEDRON SILICA COMPANY INDUSTRIAL SANDS

MINES AND MILLS IN THE WEDRON-OTTAWA DISTRICT

Circle 569 on Page 55

From B & P RESEARCH



MOTIVE SLINGERS for outstanding flexibility...

HYDRA-SLINGERS for outstanding productivity...

and now...the

MOTIVE HYDRA-SLINGER

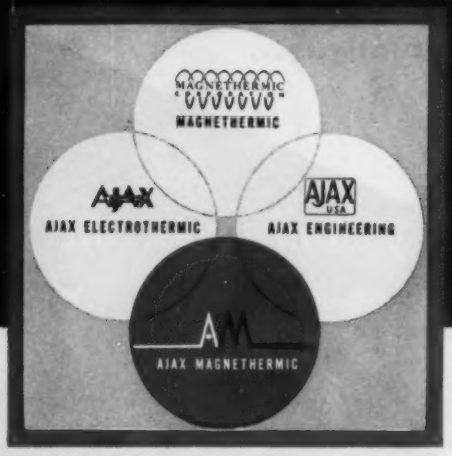
Circle 570 on Page 55

... providing proven Motive Sandslinger quality with increased capacity and precise hydraulic control. The Motive Hydra-Slinger requires no more space than the Motive Sandslinger and uses the same 3 ft. gauge track. Its ramming capacity of 12 to 15 cubic feet per minute is attained without increasing the unit's size. Remote hydraulic control, with operator's station located on the unit's tower eliminates manual effort, affords optimum visibility and assures greater accuracy. Now for the first time jobbing shops can obtain the increased productive capacity and efficiency that may previously have been considered economically unfeasible.

Write for additional information today!

BEARDSLEY & PIPER
Div. of Pettibone Mulliken Corp.
2424 N. Cicero Ave., Chicago 39, Ill.

The 180-cycle Multiductor, a low-cost static frequency converter, permits the use of induction on heating and melting applications where costs were previously prohibitive.



THE NAME WITH THE FAMILIAR RING!

The Multiductor, one of several Power Sources... another major product line of AM for the heating or melting of metals by Induction.

"induction heating is our only business"

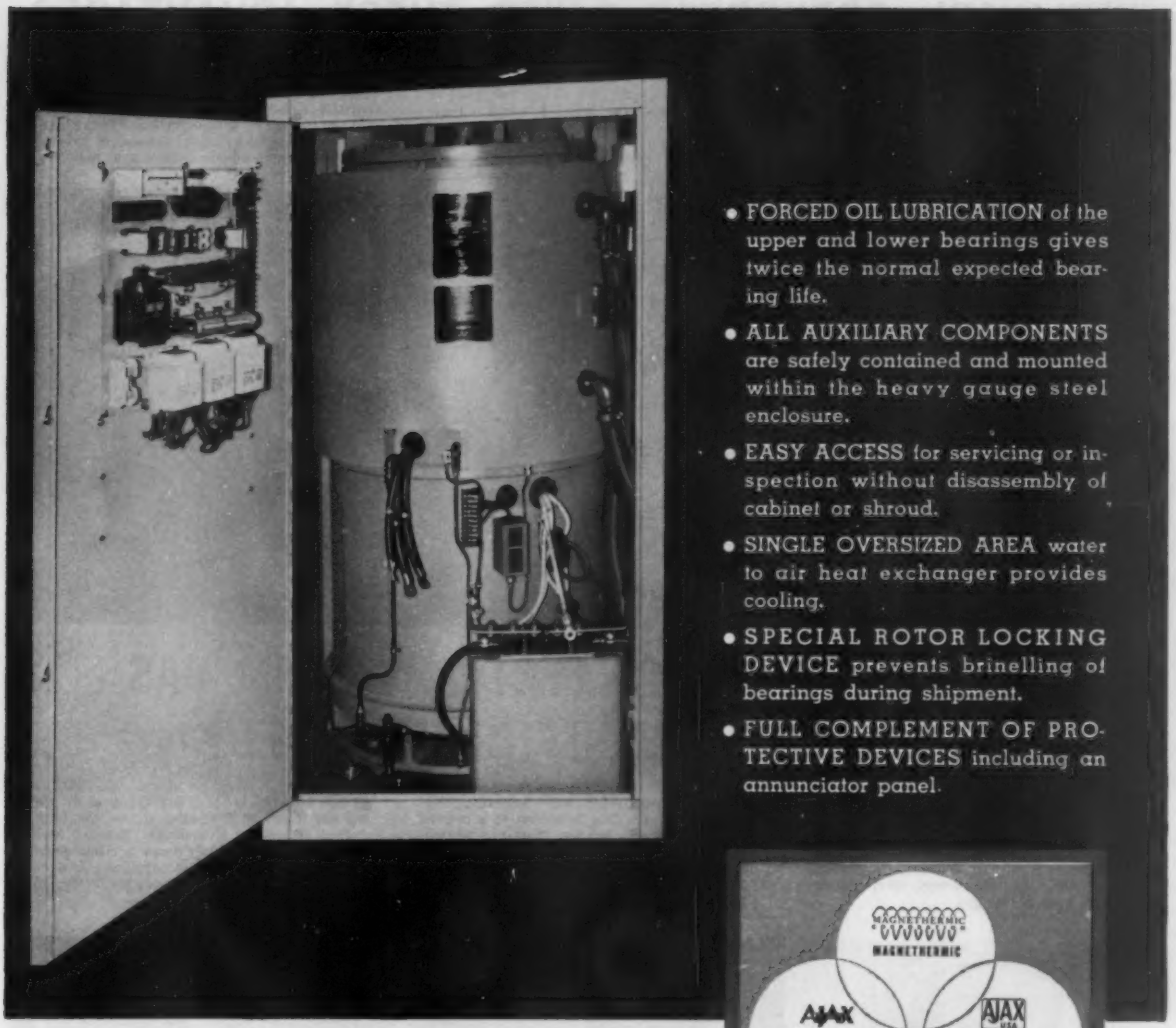
Magnethermic CORPORATION

GENERAL OFFICES
P. O. BOX 839
Youngstown 1, Ohio

TRENTON DIVISION
930 Lower Ferry Road
Trenton 5, New Jersey

YOUNGSTOWN DIVISION
3990 Simon Road
Youngstown 1, Ohio

Circle 571 on Page 55



- FORCED OIL LUBRICATION of the upper and lower bearings gives twice the normal expected bearing life.
- ALL AUXILIARY COMPONENTS are safely contained and mounted within the heavy gauge steel enclosure.
- EASY ACCESS for servicing or inspection without disassembly of cabinet or shroud.
- SINGLE OVERSIZED AREA water to air heat exchanger provides cooling.
- SPECIAL ROTOR LOCKING DEVICE prevents brinelling of bearings during shipment.
- FULL COMPLEMENT OF PROTECTIVE DEVICES including an annunciator panel.

The AM Motor Generator Unit is a proven Vertical Design with new features to improve service life and maintenance.

WATCH AM

FOR THE NEW IDEAS IN THE HEATING AND MELTING OF METALS BY INDUCTION

HIGH FREQUENCY MOTOR GENERATOR SETS

Another of the many products of AM for the heating and melting of metals by induction.

"induction heating is our only business"

Magnethermic CORPORATION

GENERAL OFFICES
P. O. BOX 436
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TRENTON DIVISION
930 Lower Ferry Road
Trenton 5, New Jersey

YOUNGSTOWN DIVISION
3990 Simon Road
Youngstown 1, Ohio

AJAX MAGNETHERMIC, CANADA, LTD.
BOX 776
Ajax, Ontario

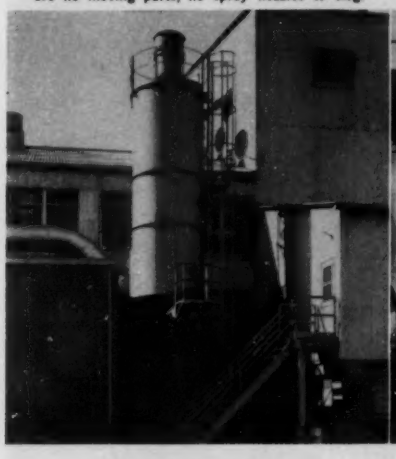
Circle 572 on Page 55

MULTI-WASH SCRUBBERS OFFER THESE ADVANTAGES:

■ **HIGH EFFICIENCY** (up to 99.9%) for the removal of dust and fumes from hooded work stations is provided by **Schneible Multi-wash Scrubbers.** Waste flows continuously to a central dewatering tank where settling process clarifies water for return to scrubber for reuse. There are no moving parts, no spray nozzles to clog.

■ **CLEAN DUST-FREE OPERATION** of mold parting stations with complete control of air is provided with standard **UNI-FLO HOOD.** Adjustable louvers allow for efficient air distribution and compensation for unusual air currents. Workmen are not subject to drafts or dust and fume spillover.

■ **FLEXIBILITY AND ADAPTABILITY** is a feature of all **Schneible UNI-FLO SHAKEOUT HOODS.** They may be used at hand operated, low-volume stations or high production lines where molds are handled by crane, monorail or pusher. One, two or three sides may be open as required.

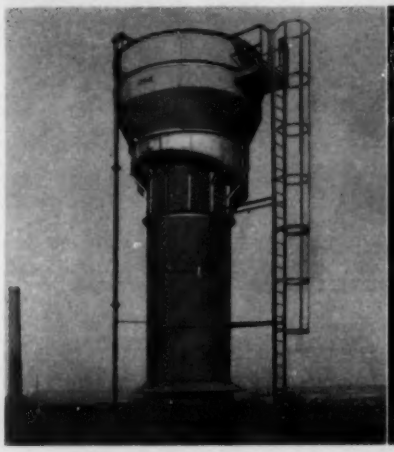


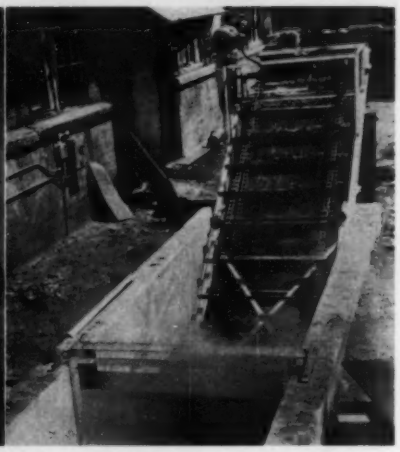
'SW' CUPOLA COLLECTOR SYSTEM HAS PROVEN BENEFITS YOU NEED!

■ **ELIMINATE COSTLY CLEANING AND REPAIRING** of roof and sash due to acid action of fly ash and fumes. **'SW' CUPOLA COLLECTOR** with patented non-clogging distribution head supplies heavy water curtain to stop fly ash and fume emissions. No fans, motors, spray nozzles or moving parts to maintain.

■ **SAVE MANPOWER** with automatic slag quench equipment. Slag is sluiced to a central disposal tank for easy removal. There is no secondary pollution problem in handling. Waste is removed as sludge to dumping facility after settling process is completed. Clarified water is pumped back for reuse.

■ **AUTOMATIC WASTE DISPOSAL** of fly ash and slag from central dewatering tank. Choice of method of removal is available. Standard tank designs permit use of tote boxes or clamshell to truck, depending on size of operation. Constant water flow assures continuous movement of waste from all areas.





AIR POLLUTION
SCHNEIBLE
CONTROL

Refer to Sweet's Plant Engineering File No. 1e 5c

PRODUCTS:

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Multi-Dyne Separators • Entrainment Separators • Settling and Dewatering Tanks • Skimmer Type Concentrating Tanks • Pressure Vessels and Storage Tanks

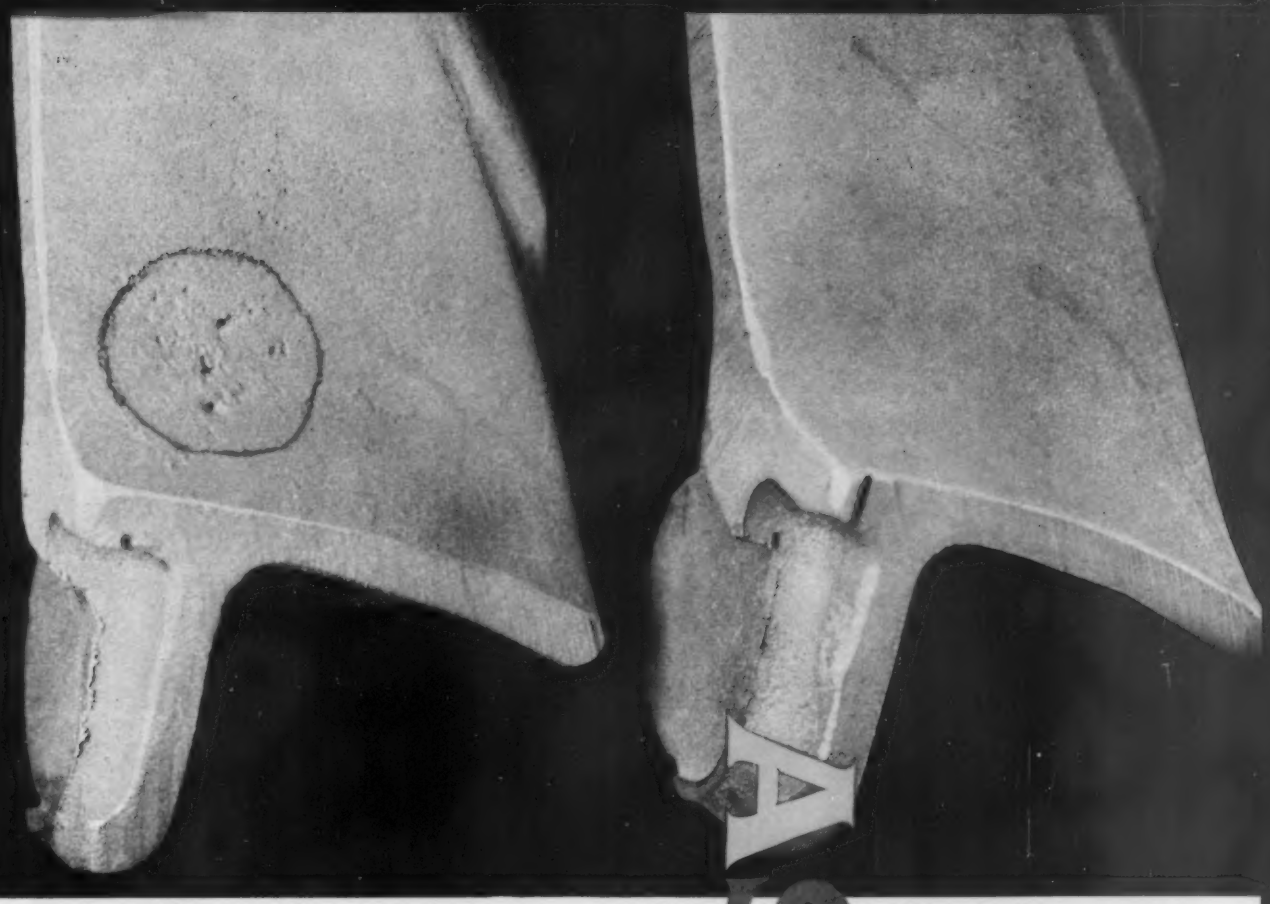
European Licensee: Elex S. A., Zurich, Switzerland
Cable Address for Foreign Inquiries: CBSCO

CLAUDE B. SCHNEIBLE COMPANY

P.O. Box 296, Roosevelt Park Annex

Detroit 32, Michigan TA 5-7772

Circle 573 on Page 55



Comparative photograph illustrates the effect of PT treatment. Casting on left from standard aluminum alloy, shows typical shrinkage over a large area. Compare with casting on right, cast in PT grade, under the same conditions! Alloy: F460 (319)

Now ASARCO process reduces and controls shrinkage

FEDERATED PT (pressure-tight) ALUMINUM CASTING ALLOYS

Use PT-processed metal instead of any of the standard sand and permanent mold aluminum casting alloys. Result: no unpredictable shrinkage. No need for extra gates and risers. Higher yield per pound of metal. More uniform pressure-tight castings. A brighter cleaner surface. All the same physical and mechanical properties and characteristics. Write or call today for full information about PT grade aluminum, to Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, RE 2-9500; or call your nearest Federated sales office.

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AMERICAN SMELTING AND REFINING COMPANY

FEDERATED METALS DIVISION

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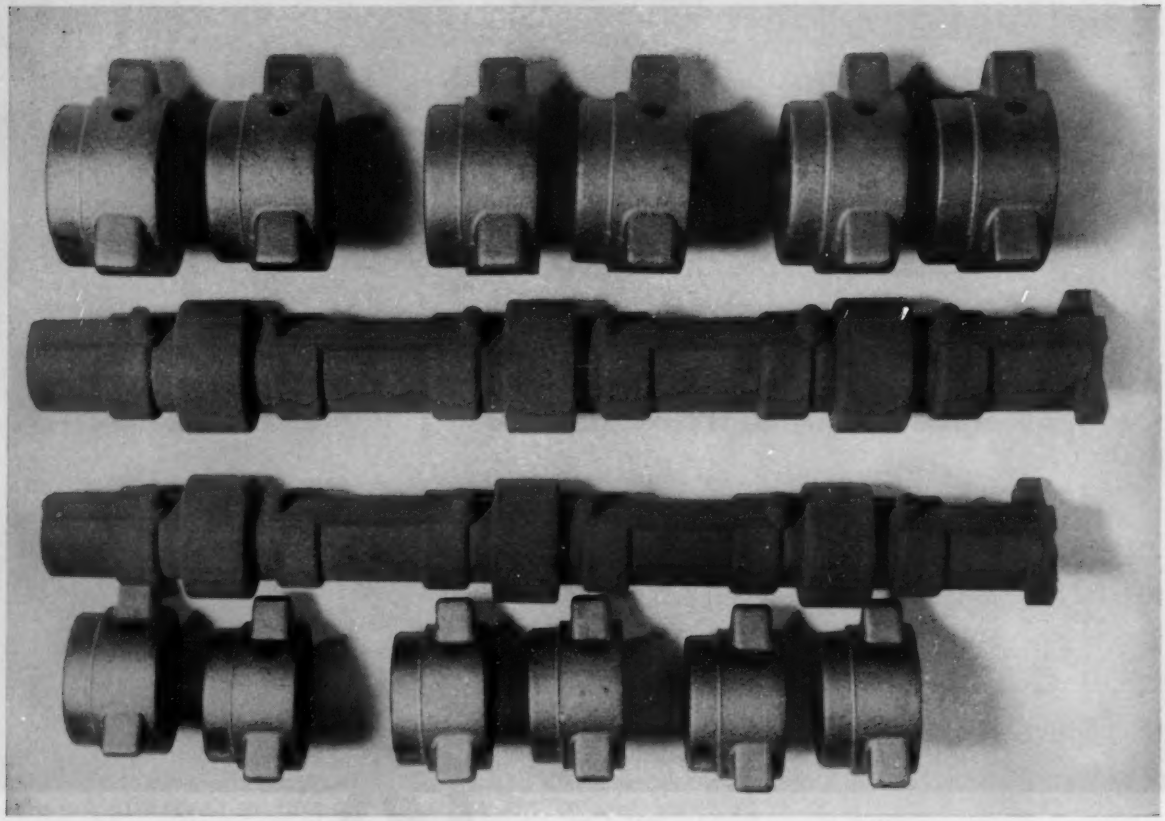
Circle 574 on Page 55



Look what happens to costs when foundry switches to shell cores made with Durez resins

Lavelle Foundries, Anderson, Indiana, casts such things as pump parts, motor housings, venturi fittings and other parts for gas burners. Small, light, a lot of them are needed to account for a ton of iron.

So scrap losses came high. Or did, until shell cores' quality and accuracy helped cut them down to a minimum. More important, with shell cores made from Durez foundry resins it is possible to find and correct the *causes* of poor castings within a few hours, instead of the days or even weeks often required with sand cores.

And costs tumbled even further when gang cores were employed. It took only two cores to make the 12 castings shown in the photo . . . where, before, eight single cores were set per mold.

Finally, with better finishes, closer tolerances, more uniform wall thickness, Lavelle castings save additional sums for customers. Less machining, fewer secondary operations.

OTHER ADVANTAGES

No need for core dryers, less chance for warpage, uniform heat transfer over entire core surface. Less sand to buy, less to handle. Cores are lighter, tougher, can be stacked in stockpiles.

Write for a copy of *Durez Guide to Shell Molding*. It contains all the very latest data on this cost-cutting method.

DUREZ PLASTICS DIVISION
HOOKER CHEMICAL CORPORATION, 1009 WALCK RD., NORTH TONAWANDA, N. Y.

HOOKER CHEMICALS PLASTICS

Circle 575 on Page 55

HINES ROUND SLIP FLASKS and JACKETS

Used in place of rectangular tight flasks, these round slip flasks and jackets will turn out more good castings with less sand, reduce investment in flask equipment and increase production capacity.

One of many HINES developments contributing to better foundry production

- Recommended for the casting of fire pots, gears, pulleys, sheaves and products of similar shape.
- Molding jobs previously made on the floor can be put on the bench or machines.
- Shake-out costs are much lower.
- Less storage necessary — floor space is saved.
- Equipped with handles on cope and drag for two-man lift, trunnions for handling with a hoist, split trunnions for "Rota-Lift" or trunnion pads.
- Diameters — 12" to 36"; cope and drag depths — every ½" from 3" to 5½". Upset frames available.

Standard HINES pins, bushings or guides.

WRITE FOR CATALOG FOLDER NO. 202

THE HINES FLASK CO.

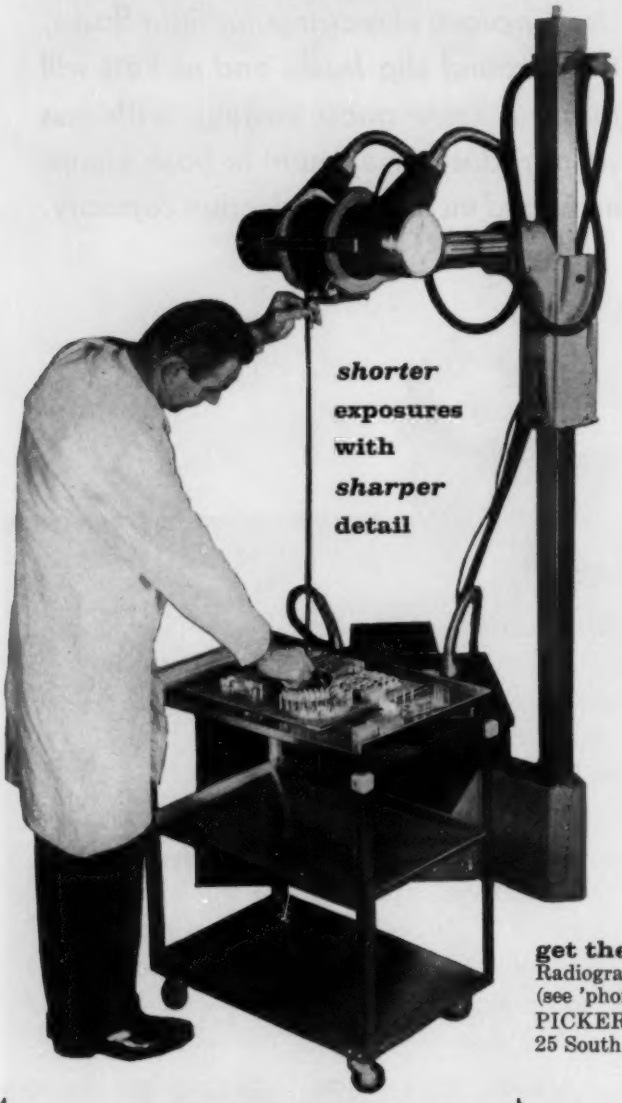
3431 WEST 140th STREET • CLEVELAND 11, OHIO

HINES FLASKS

Circle 576 on Page 55

new 150 kv x-ray unit

outstanding for inspection of { **steel** up to 1/2" thick / **aluminum** up to 4"



reduces exposure
(as much as 20%)
high full wave output

sharpest detail
ultrafine 0.3 mm focal spot
rotating anode tube on
rocksteady tubestand

6 ma continuous operation
twice the rating of typical
stationary-anode tube with
0.4 mm focal spot

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both generator and control are
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ideal for fluoroscopy
with Picker Image Intensifier
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ONE STOP ***for all this*** | ***in non-destructive inspection equipment***

Picker x-ray
PICKER X-RAY CORPORATION
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x-radiography	ANDREX portable x-ray units-140 KV, 160 KV, 200 KV, 260 KV PICKER x-ray units—35 KV Beryllium window, 90 KV, 110KV, 150 KV (stationary and mobile), 270 KV portable
gamma radiography	PICKER *Pipeliner*—30 curies, Ir^{192}, *Cyclops*—1500 curies; Co^{60} TECH/OPS Iridium^{192} units from 10 to 100 curies; Cobalt^{60} 3 to 100 curies: also Thulium^{170}, Cesium^{137}
fluoroscopy	PICKER Image Intensifier and associated equipment
magnetic particle	PICKER *Ferroscope* *Ferroflux* *Portaflux* PIXmag Ferropowders and pastes
dye penetrant	PIXchek Penetrants, Cleaners, Developers, and accessories

OTTAWA SILICA SANDS...

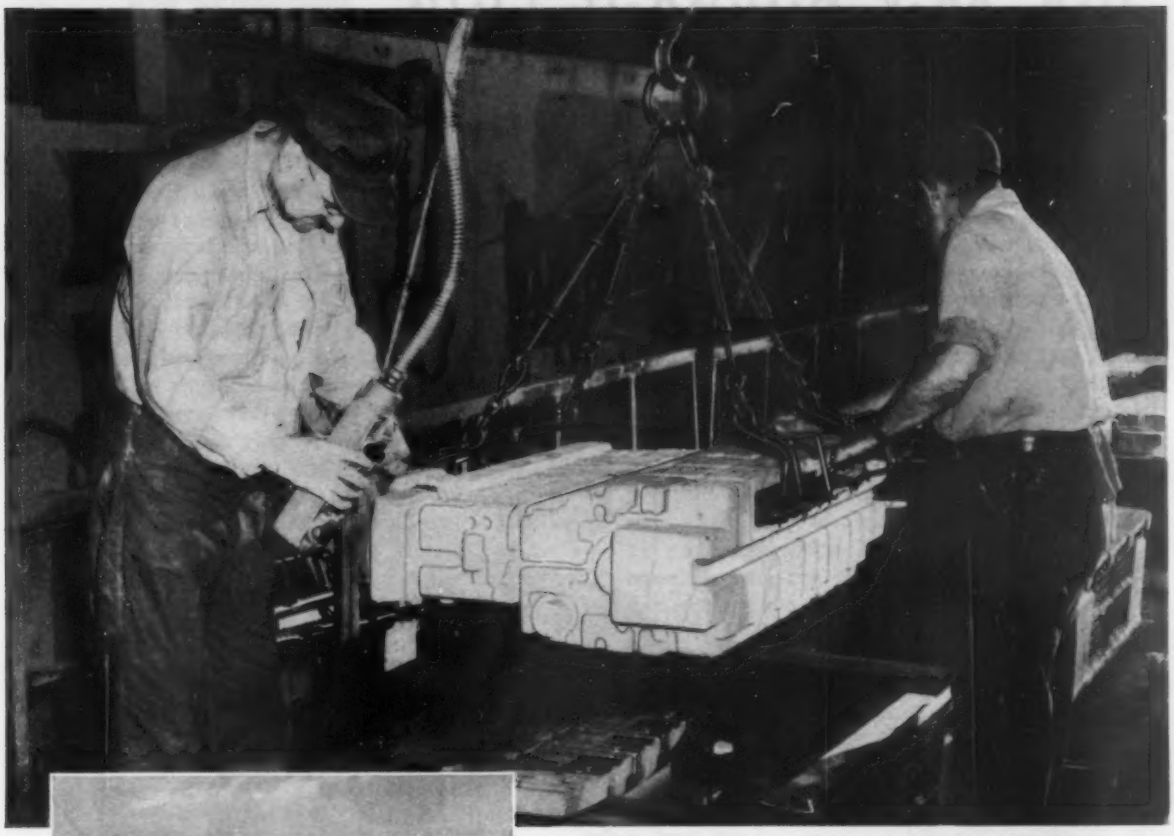

Photo courtesy of Caterpillar Tractor Co.

CORE SETTING STATION AT CATERPILLAR TRACTOR CO.
Cylinder block line, Peoria, Illinois plant.

Caterpillar Tractor Co. has used Ottawa Silica Sand for 30 years for these reasons: Availability — performance — cost. Caterpillar requires large tonnages of core sand and must have a dependable source of supply. Cores produced with Ottawa silica sand are uniform in hardness. Two important cost-saving factors are *low oil requirements and high reclaimability.*

Look to Ottawa Silica for ROUNDNESS OF GRAIN AND FREEDOM FROM AGGLOMERATES . . . GRAIN SIZE CONTROL, car-after-car.

Mail us your type of metal and size of casting section—we will be happy to send recommendations for grain size.

A Caterpillar crawler tractor FJP at work on trans-Canadian Highway, near Field, B.C., Canada (core of engine block produced with Ottawa Silica Sand).

99.9%
PURE

Serviced by two main trunk railway systems, Ottawa Silica offers fast delivery to all corners of the nation.

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SILICA COMPANY
PLANTS LOCATED IN
OTTAWA, ILL. AND ROCKWOOD, MICH.
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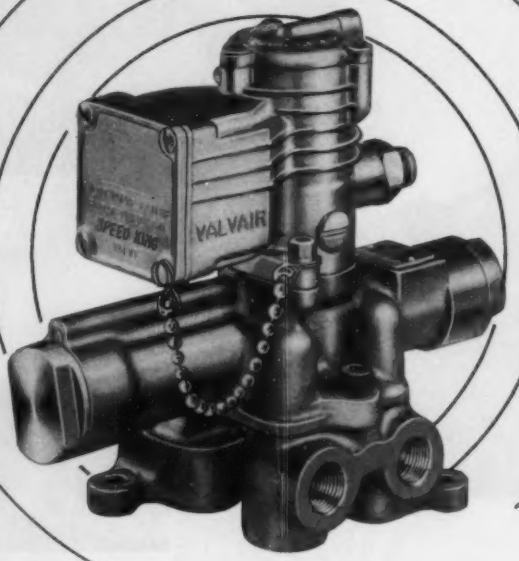
SERVING THE FOUNDRY, GLASS AND CERAMIC INDUSTRIES FOR OVER 50 YEARS

Circle 578 on Page 55

No coil burnout with SPEED KING®



...pilot operated control valves

• Built to JIC standards • interchangeable pilots • choice of mounting types, optional features • ac or dc, any voltage • ¼ to 1 in. NPT

SPEED KING solenoid pilot coils, potted in molded resin, are unconditionally guaranteed against coil burnout for the life of the valve! And, Speed King pilots are totally enclosed, and sealed against entrance of dirt or moisture . . . valves are fully air-operated for speed and dependability . . . feature a hard-chrome plated stainless steel plunger floating in O-rings, to eliminate wear-producing metal-to-metal contact.

For multi-million cycle dependability, specify Valvair® SPEED KING control valves.

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Write for free Bulletin SK-100. Address: Bellows-Valvair, Akron 9, Ohio, Dept. FO-960.

Bellows-Valvair

The Bellows Co. • Valvair Corp. Akron 9, Ohio

DIVISIONS OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

Circle 579 on Page 55

Late News

THE CASTINGS MARKET: Castings production will have to hit a fast clip in the last quarter to make up for a poor summer. Unless it does, the first half will not be equaled by the second. As fall moves in, however, the tempo should pick up, if for no other reason than that '61 automobiles will be on the road soon. Most observers feel that the new models may be just what the economy needs—particularly since there will be four new compacts and some striking changes in the old-name cars.

Increased machine tool sales also are expected to pep things up. Last-half sales, most of which will come after the Machine Tool Exposition this month, are expected to be from 10 to 15 per cent higher than those in the first half, which would amount to as much as an almost $50 million increase.

EXPANSION: Fairbanks Co. is making a $100,000 addition to the iron foundry of its Binghamton, N. Y., valve plant. The new space will be used for coremaking, cleaning, and pattern storage. Former core and cleaning rooms will be converted to machining.

SCRAP FREIGHT RATES: The Institute of Scrap Iron & Steel and 360 member companies have petitioned the Interstate Commerce Commission to order 49 Eastern railroads to change rate on scrap iron in 100,000-lb loading to 50 per cent of the existing rates on 80,000 lb of new steel. They also ask that scap iron rates be no greater than 150 per cent of existing rates on iron ore. The complainants charge that scrap iron rates generally are greater than pig iron rates for the same mileages and

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1958	50,242,746	7,725,970	821,388	7,152,726
1959				
Apr.	6,644,905	911,313	106,972	996,126
4 mo.	24,355,319	3,359,477	383,803	3,530,155
May	6,642,572	868,661	99,256	1,029,573
June	6,322,404	885,497	104,683	997,921
July	3,584,931	750,208	87,441	603,726
Aug.	1,875,165	691,786	81,184	374,678
Sept.	2,114,015	801,588	99,090	441,134
Oct.	2,266,709	798,569	98,279	445,137
Nov.	4,796,896	614,233	82,784	801,555
Dec.	7,021,870	843,040	99,577	1,008,158
Total	58,979,881	9,613,059	1,156,097	9,232,037
1960				
Jan.	7,043,438	823,442	95,442	1,058,159
Feb.	6,493,558	822,476	97,688	1,015,716
Mar.	6,655,569	839,016	106,749	974,535
Apr.	5,625,717	754,486	82,767	787,186
4 mo.	25,818,332	3,239,420	382,646	3,835,596

Index of Foundry Equipment Orders

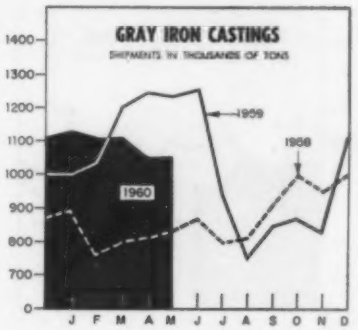
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1959	1958
Jan.	127.4	95.5
Feb.	237.1	128.6
Mar.	166.6	159.9
Apr.	154.2	97.9
May	157.0	159.0
June	125.1	164.8
July	110.7	....
Aug.	134.1	....
Sept.	131.3	....
Oct.	140.8	....
Nov.	131.2	....
Dec.	95.9	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3]
1958	10,357,504	5,849,426	6,146,186	2,648,005	117,588	1,884,396	265,114	1,277,685	784,123	.....
1959										
May	1,235,106	684,141	705,307	284,741	16,003	275,563	36,960	141,675	75,601	834,779
5 mo.	5,720,230	3,090,258	3,398,381	1,366,627	69,227	1,262,028	167,020	530,714	362,107	.....
June	1,250,872	715,923	706,525	294,296	15,510	268,479	30,723	160,540	84,605	836,707
July	931,569	531,768	598,656	252,149	14,508	99,670	20,486	133,175	79,582	897,536
Aug.	742,420	505,612	484,678	253,466	11,046	13,482	18,479	145,853	79,928	872,993
Sept.	848,899	527,001	584,669	278,591	11,875	19,416	16,272	142,660	75,882	883,278
Oct.	870,635	519,178	621,833	277,161	17,797	20,155	19,647	139,716	69,284	836,970
Nov.	830,360	514,888	492,742	249,576	12,698	165,139	16,723	96,086	59,670	835,368
Dec.	1,106,796	583,571	649,200	270,276	14,651	294,129	20,596	92,139	50,733	845,575
Total	12,301,781[4]	6,988,199	7,546,664	3,242,144	167,312	2,142,498	309,945	1,440,883	861,791	.....
1960										
Jan.	1,135,575	591,804	677,392	277,100	16,774	295,964	18,463	86,798	56,928	851,336
Feb.	1,107,721	571,143	678,927	279,190	16,436	284,738	17,848	76,332	49,876	855,324
Mar.	1,143,395	600,162	685,102	284,207	15,670	294,322	24,409	83,121	56,441	880,132
Apr.	1,051,357	580,590	609,234	258,994	13,986	232,895	21,737	118,886	68,605	834,495
May	1,052,382	588,359	613,329	256,769	12,710	207,094	20,414	136,455	75,090	834,495
5 mo.	5,490,430	2,932,058	3,263,984	1,366,260	75,564	1,315,043	102,871	501,592	306,940	.....

*Source: U. S. Dept. of Interior Bureau of Mines. [1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale. [4]Gray iron total includes nodular iron.

movements and in some instances almost four times those of iron ore. These disparities are claimed to have caused a 10-million-ton annual decrease in the use of scrap iron.

BUILDING TRENDS: Although construction work in the aggregate has been active so far this year, wide swings compared with a year ago are evident in certain classifications. For the first half, F. W. Dodge Corp. reports commercial building contracts about equaled 1959's record pace; residential building was down 14 per cent; manufacturing building was up 10 per cent; educational building gained 12 per cent; hospital construction was off 24 per cent; public and religious buildings both eased 2 per cent; public works contracts rose 2 per cent, and utility contracts dropped 13 per cent. Total contracts of $17.6 billion were down 7 per cent from last year.

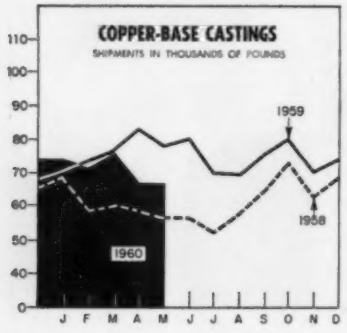
EXPANDS LINE: Triplex Div., Aluminum Industries Inc., Pueblo, Colo., has erected new facilities to produce heavy aluminum industrial castings, compressor parts, and other nonautomotive work. In the past Triplex has made only aluminum automotive pistons, of which it reportedly has been one of the world's largest producers. The company employs 625 persons.

ACQUISITION: All-State Engineering Co., Milwaukee, has bought the Industrial Crane & Hoist operation of Borg-Warner Corp., Chicago, and will move it to Milwaukee where a plant addition has been built to handle the expansion.

CAR BACKLOGS OFF: Freight car builders are shipping cars faster than new orders are being received. July shipments totaled 3893, compared with orders for 1306, cutting backlogs to 26,658. Backlog last Aug. 1 was 40,309 cars.

PERSONALS: Kenneth M. Halvorson, chief engineer, has been made general superintendent, Belle City Malleable Iron Co. and Racine Steel Castings Co., Racine, Wis. Homer T. Sheppard, director of metallurgy, now is superintendent of melting and metallurgy . . . Robert A. Titlow, plant manager, Fabricast

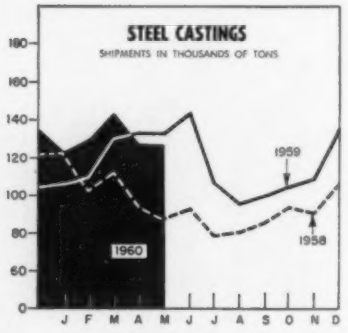
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1958	762,484	697,380	31,854	.....
1959				
May	75,963	66,954	4,311	27,074
5 mo.	370,584	327,329	20,906	.....
June	77,282	68,439	4,370	30,389
July	66,625	59,254	3,817	31,820
Aug.	66,531	57,949	4,359	32,117
Sept.	73,290	63,813	4,758	29,396
Oct.	77,385	67,186	5,120	28,092
Nov.	68,255	59,094	4,840	29,147
Dec.	71,110	62,182	4,286	29,243
Total	871,032	765,246	52,456	.....
1960				
Jan.	73,971	65,742	3,915	26,053
Feb.	71,797	63,103	4,146	26,970
Mar.	75,908	66,517	4,346	27,470
Apr.	66,777	58,453	4,523	27,423
May	66,245	57,848	4,463	24,582
5 mo.	354,698	311,663	21,493	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

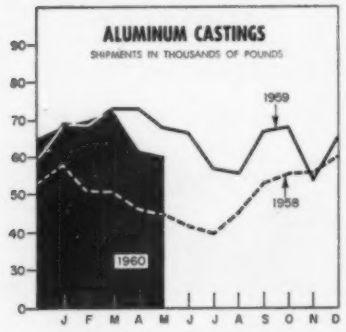
	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1958	1,121,000	856,986	149,644	801,846	606,240	136,251	319,154	250,746	13,393	.....
1959										
May	135,359	105,804	23,825	101,504	78,767	22,498	33,855	27,037	1,327	263,969
5 mo.	616,692	483,238	94,377	449,725	351,821	86,943	163,707	131,413	6,444	.....
June	143,624	111,725	26,567	107,000	82,485	24,568	36,624	29,240	1,999	248,782
July	106,448	83,540	16,007	77,990	60,501	14,520	28,458	23,039	1,487	274,065
Aug.	98,014	79,188	17,607	74,825	60,243	16,373	23,189	18,945	1,234	279,261
Sept.	99,731	79,963	13,975	73,648	58,453	12,830	26,083	21,510	1,145	256,871
Oct.	105,570	84,850	11,819	80,127	63,901	10,978	25,443	20,108	841	268,874
Nov.	109,460	86,026	11,764	77,320	59,294	10,799	32,240	26,732	965	301,858
Dec.	133,346	104,138	18,868	99,643	77,517	17,200	33,703	26,621	1,668	306,346
Total	1,412,885	1,112,668	210,984	1,043,538	814,219	194,201	369,347	298,449	16,783	.....
1960										
Jan.	122,565	94,052	22,016	93,197	70,815	20,891	29,368	23,237	1,125	314,237
Feb.	129,259	97,927	26,532	96,858	72,963	25,328	32,371	24,964	1,204	279,684
Mar.	143,708	109,688	27,801	104,742	78,755	26,365	38,966	30,933	1,436	277,982
Apr.	127,219	96,557	26,101	93,433	70,251	24,526	33,786	26,306	1,575	248,902
May	126,580	97,231	26,793	93,700	71,808	25,324	32,880	25,423	1,469	252,923
5 mo.	649,331	495,455	129,243	481,960	364,592	122,434	167,371	130,863	6,809	.....

[1]Source: Bureau of the Census. [2]For sale only.

plant, Central Foundry Div., GMC, Jones Mills, Ark., has been promoted to general superintendent, Bedford, Ind., plant. Robert P. Hendrichs, recently sales manager, nonferrous metals, succeeds Mr. Titlow at Jones Mills . . . John McCormick, chief engineer, Casting Engineers, has been made plant manager of the firm's newly acquired Jelrus Precision Casting Co., New York . . . Donald A. Lyons has been named director of customer services, Greenlee Foundry Div., Chicago. He had been foundry superintendent . . . Jerry A. Havnen, recently foundry and engineering manager, Burnham Corp., Zanesville, Ohio, has been made plant manager. B. N. Greenlaw continues as vice president with supervision over the Lancaster, Pa., and Zanesville plants . . . Aldo J. Sartor has joined Pangborn Corp. as sales engineer in the Detroit office.

OBITUARY: A. Lysle Dyer, plant manager, Buckeye Foundry Co., Cincinnati, died Aug. 21 . . . Dr. H. K. Ihrig, 62, vice president of research, Allis-Chalmers Mfg. Co., Milwaukee, died Aug. 22 . . . Herman G. Hetzler, 68, president, Hetzler Foundries Inc., Rochester, N. Y., died Aug. 9 . . . Stanley W. Ewing, 66, Pittsburgh sales representative, International Graphite Electrode Corp., St. Marys, Pa., died Aug. 5.

MISCELLANY: Hewitt-Robins Inc., Stamford, Conn., will acquire Union Chain & Mfg. Co., Sandusky, Ohio, operating the latter as a division . . . July orders for industrial heating equipment of about $4 million were off 8 per cent from June and for the first seven months dropped 14 per cent from a year ago . . . Production of primary aluminum in July was slightly ahead of June and about the same as in 1959; total for the first seven months was nearly 6 per cent larger than last year . . . Crown Pipe & Foundry Inc., Jackson, Ohio, has reopened after a shutdown of almost four years . . . June sales index of the Material Handling Institute was 160, against 150 in May and 171 a year ago . . . Dow Chemical Co. has discontinued operations of Sequoia Metalcraft Co., San Carlos, Calif., a magnesium foundry which it acquired last November . . . Ideal Furnace Co., Milan, Mich., and Homer Foundry Corp., Coldwater, Mich., reportedly have merged.



PRODUCTION WORKERS

Estimated Number

	May 1960	April 1960	May 1959
Ferrous	189,700	194,000	195,900
Nonferrous	49,500	51,200	53,000

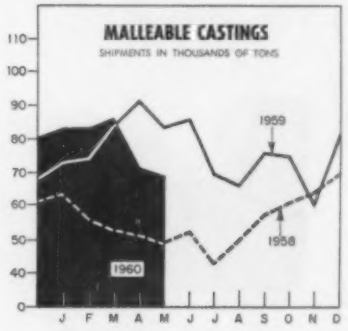
Average Weekly Earnings

Gray Iron	96.19	93.58	99.95
Malleable Iron	89.65	92.16	97.34
Steel	102.70	101.27	104.96
Nonferrous	101.58	97.32	99.70

Average Weekly Hours

Gray Iron	39.1	38.2	41.3
Malleable Iron	37.2	38.4	40.9
Steel	39.5	39.1	41.0
Nonferrous	40.6	39.4	41.2

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1958	641,700	125,487	224,692	290,275	.....
1959					
May	68,406	11,924	25,561	30,792	80,325
5 mo.	352,832	58,855	130,061	163,353	.....
June	66,609	12,251	25,204	29,007	81,228
July	57,048	11,526	20,687	24,701	80,450
Aug.	56,041	11,074	18,102	26,733	82,488
Sept.	66,331	12,254	21,783	32,154	81,839
Oct.	67,635	12,902	22,058	32,555	78,930
Nov.	54,695	10,757	16,604	27,219	84,392
Dec.	65,206	12,368	20,356	32,379	86,947
Total	786,399	141,987	274,855	368,101	.....
1960					
Jan.	68,247	11,278	22,368	34,514	92,109
Feb.	71,699	11,800	23,614	36,177	83,914
Mar.	72,216	12,934	22,413	36,749	78,024
Apr.	61,797	12,339	19,950	29,400	75,243
May	60,330	10,682	21,507	28,055	75,977
5 mo.	334,289	59,033	109,852	164,985	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	For Sale	Standard Total	For Sale	Pearlitic Total	For Sale	Unfilled Orders[2]
1958	660,650	383,839	540,600	313,597	120,050	70,242	.....
1959							
May	83,472	49,619	66,512	40,438	16,960	9,181	99,879
5 mo.	406,727	239,375	320,807	191,903	85,920	57,472	.....
June	85,497	51,411	68,426	42,453	17,071	8,958	95,339
July	69,184	43,128	55,120	35,787	14,064	7,341	75,252
Aug.	65,062	40,143	53,217	33,224	11,845	6,919	85,852
Sept.	76,063	46,469	60,209	36,619	15,854	9,850	82,274
Oct.	75,511	48,625	61,683	40,088	13,828	8,537	85,031
Nov.	58,258	42,235	48,951	33,981	9,307	8,254	82,555
Dec.	80,060	45,917	61,455	35,891	18,605	10,026	93,874
Total	916,362	557,303	729,868	449,946	186,494	107,357	.....
1960							
Jan.	83,188	46,154	63,637	35,933	19,551	10,221	100,302
Feb.	83,118	46,850	64,131	37,391	18,987	9,459	98,272
Mar.	86,243	49,907	67,448	40,422	18,795	9,485	84,679
Apr.	71,271	39,059	56,136	32,066	15,135	6,993	79,237
May	68,942	37,618	53,108	30,126	15,834	7,492	73,240
5 mo.	388,762	219,588	304,460	175,938	88,494	43,650	.....

Prices of Foundry Metals and Coke

(As of August 29, 1960)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-$18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearney, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Boston, deld.	75.70	76.20
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Fontana, Calif.	75.50	....
Geneva, Utah.	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	68.50
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 29.25; tin bronze, No. 225, 39.50; No. 245, 34.00; high-leaded tin bronze, No. 305, 33.75; No. 1 yellow, No. 405, 23.75; manganese bronze, No. 421, 28.25.

ALUMINUM: Primary alloy No. 13, 25.90; No. 43, 26.20; No. 195, 30.70; No. 214, 31.50; No. 356, 26.80. Secondary No. 12 alloy, 23.75-24.25. Deoxidizing grades: No. 1, 25.00; No. 4, 22.25.

MAGNESIUM ALLOY: AZ63A, 37.50; AZ91B, 37.25; AZ91C, 41.25; AZ92A, 37.50.

COPPER: Electrolytic 33.00, delivered Connecticut valley.

ZINC: High grade 14.35, delivered. Die casting alloy No. 3, 16.25; No. 2, 16.75, delivered.

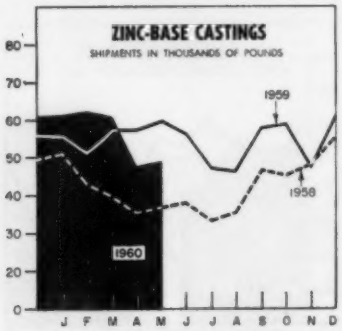
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Machinery Cast	Structurals, Plates	Malleable	Short Steel Rails
Birmingham	$29.00-30.00	$46.00-47.00	.....	**40.00-42.00	$36.00-37.00	.....	$45.00-46.00
Boston*	**24.00-24.50	**39.00-40.00	.....	**47.00-48.00	.....	.....	.....
Buffalo	29.00-30.00	**40.00-41.00	.....	47.00-48.00	37.00-38.00	.....	47.00-48.00
Chicago	32.00-33.00	42.00-43.00	.....	**48.00-49.00	35.00-36.00	46.00-47.00	49.00-51.00
Cincinnati*	**26.50-27.50	**36.00-37.00	**31.00-32.00	50.00-51.00	**35.00-36.00	.....	**51.00-52.00
Cleveland	31.00-32.00	44.00-45.00	30.00-31.00	.....	37.00-38.00	45.00-46.00	50.00-52.00
Detroit*	**25.00-26.00	**35.00-36.00	**29.00-30.00	.....	.....	.....	.....
Los Angeles	32.00	43.00	.....	.....	43.00	.....	.....
New York*	31.00-32.00	36.00-37.00	30.00-31.00	50.00	38.00-39.00	.....	.....
Philadelphia	35.00	39.00	40.00	47.00-48.00	38.00-40.00	46.00	.....
Pittsburgh	31.00-32.00	38.00-39.00	.....	.....	36.00-38.00	.....	50.00-52.00
St. Louis*	31.00	43.00	.....	40.00	.....	40.00	41.00
San Francisco	34.00	48.00	28.00	.....	.....	.....	.....
Seattle	38.50	35.00	36.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

Foundry Statistics



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1958	500,071	319,471	.....
1959			
May	58,547	41,811	62,224
5 mo.	271,843	188,341	.....
June	54,017	38,116	54,097
July	44,646	32,497	52,677
Aug.	44,456	32,573	56,090
Sept.	56,035	38,288	60,953
Oct.	57,106	40,487	57,814
Nov.	44,611	35,301	58,076
Dec.	58,496	37,406	65,723
Total	631,210	443,009	.....
1960			
Jan.	61,537	39,777	64,940
Feb.	62,925	42,089	66,945
Mar.	60,816	39,618	60,267
Apr.	47,553	31,423	56,312
May	50,844	33,551	56,654
5 mo.	283,675	186,458	.....

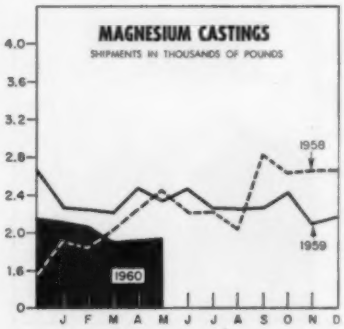
PIG IRON

PRODUCTION*—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1958	1,622,320	2,448,917	4,954,854
1959			
June	188,158	346,231	441,052
6 mo.	1,032,223	1,863,275	2,546,935
July	166,378	173,760	258,935
Aug.	N.A.	N.A.	N.A.
Sept.	N.A.	N.A.	N.A.
Oct.	N.A.	N.A.	N.A.
Nov.	148,660	180,927	216,063
Dec.	177,017	306,303	452,426
Totals[2]	1,889,445	2,810,359	3,471,683
1960			
Jan.	128,232	325,151	462,667
Feb.	148,238	338,566	471,755
Mar.	126,357	333,182	462,914
April	134,509	258,452	395,875
May	135,825	290,057	356,931
June	105,717	247,991	309,942
6 mo.	778,878	1,796,421	2,460,084

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1958	3,314,652	169,267	231,145
1959			
Apr.	366,378	21,997	41,597
4 mo.	1,366,541	77,695	158,258
May	358,192	20,424	40,812
June	366,136	20,390	39,867
July	311,327	16,391	20,437
Aug.	288,547	15,937	4,923
Sept.	336,015	18,067	6,033
Oct.	351,679	20,011	5,749
Nov.	276,168	16,350	28,231
Dec.	334,524	18,613	47,045
Total	3,989,129	223,868	351,355
1960			
Jan.	328,242	18,634	45,936
Feb.	322,945	19,257	42,883
Mar.	317,520	21,042	43,959
Apr.	252,178	16,796	36,971
4 mo.	1,250,885	75,729	169,749



MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1958	28,776	25,024	.....
1959			
May	2,360	2,084	5,102
5 mo	11,446	10,264	.....
June	2,474	2,197	4,664
July	2,254	1,865	3,995
Aug.	2,233	1,742	3,809
Sept.	2,253	1,822	3,823
Oct.	2,426	1,880	3,501
Nov.	2,013	1,618	3,281
Dec.	2,154	1,721	3,423
Total	27,253	23,109	.....
1960			
Jan.	2,135	1,588	3,209
Feb.	2,075	1,679	3,278
Mar.	1,903	1,524	3,208
Apr.	1,926	1,533	3,138
May	1,953	1,514	2,948
5 mo.	9,992	7,838	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

Drop by Drop . . . IN 1959
FOUNDRYMEN USED
241 TONS OF
LYQUAGRIP*

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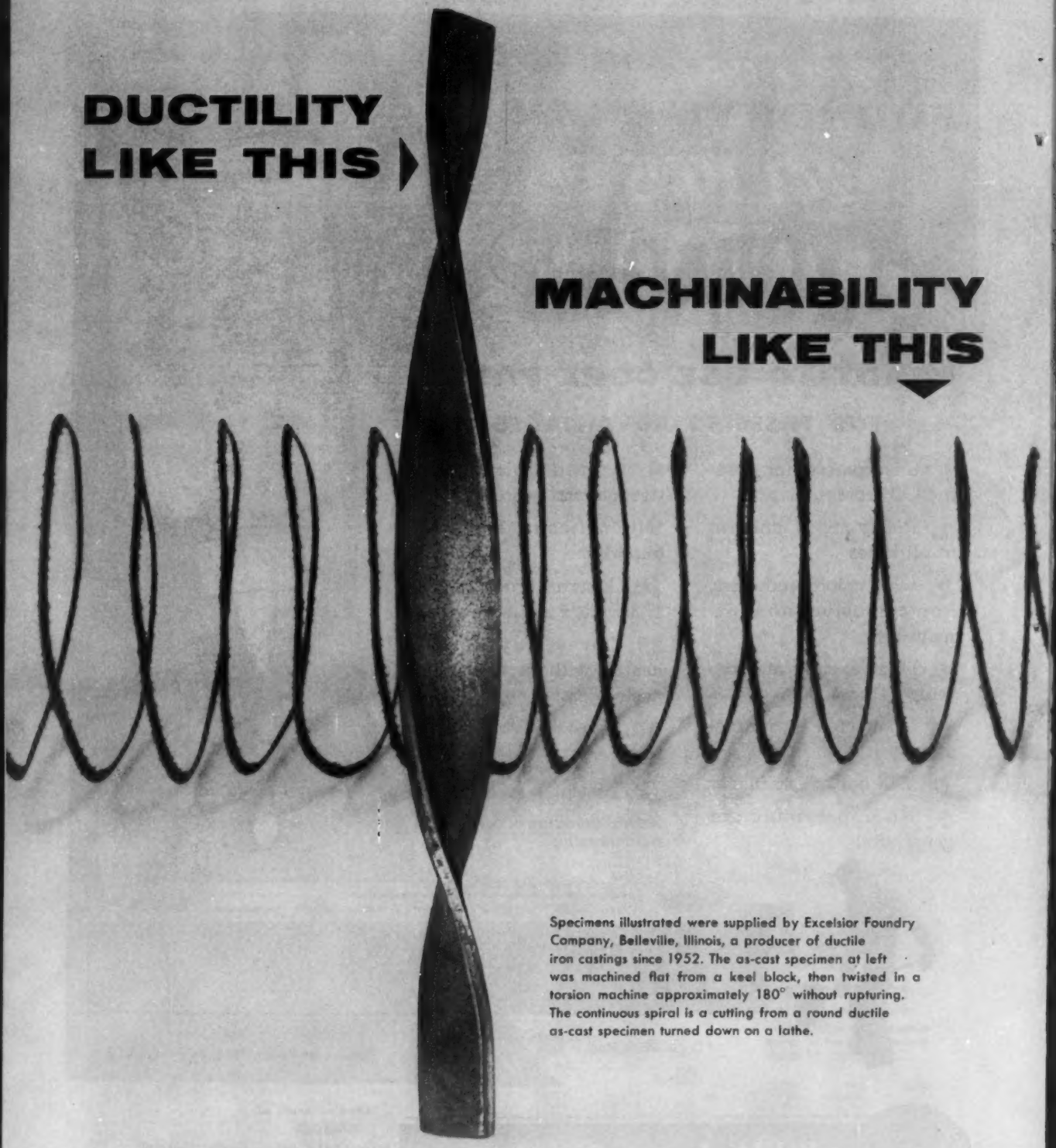
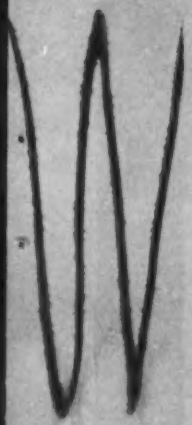
DUCTILITY LIKE THIS

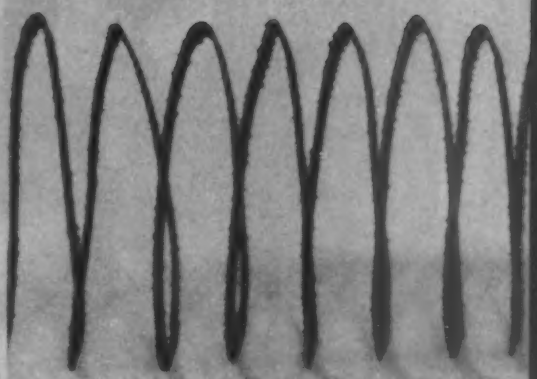
MACHINABILITY LIKE THIS



Specimens illustrated were supplied by Excelsior Foundry Company, Belleville, Illinois, a producer of ductile iron castings since 1952. The as-cast specimen at left was machined flat from a keel block, then twisted in a torsion machine approximately 180° without rupturing. The continuous spiral is a cutting from a round ductile as-cast specimen turned down on a lathe.



. . . when Chateaugay Pig Iron is the base metal in ductile iron castings



The finest spheroidal graphite or ductile types of cast iron possess many of the engineering advantages of steel—ductility, high strength, toughness, machinability, heat- and wear-resistance—when they are produced with Chateaugay Pig Iron.

High total carbon and unusually low manganese, phosphorus, and sulphur content suit Chateaugay perfectly for production of high ductility as-cast grades of ductile iron.

Chateaugay's consistently uniform chemical analysis is an important factor in achieving as-cast properties, especially ductility. Freedom from excessive amounts of subversive elements assures the formation of graphite nodules. Additionally, the inherently excellent properties of Chateaugay Pig Iron are maintained in the ductile form.

Castings produced with Chateaugay are of consistently high quality with close grain and uniform structure. And, because it can be cast without excessive shrinkage, adjoining light and heavy sections are filled completely. This assures strong, flaw-free castings accurate to patterns and shapes.

To assist you in using Chateaugay to best advantage, Republic provides a complete foundry engineering service covering all phases of foundry operation—metallurgical, molding practice, gating, risering, and cupola practice. Contact your Republic representative, or mail the coupon for prompt service.

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Company_____

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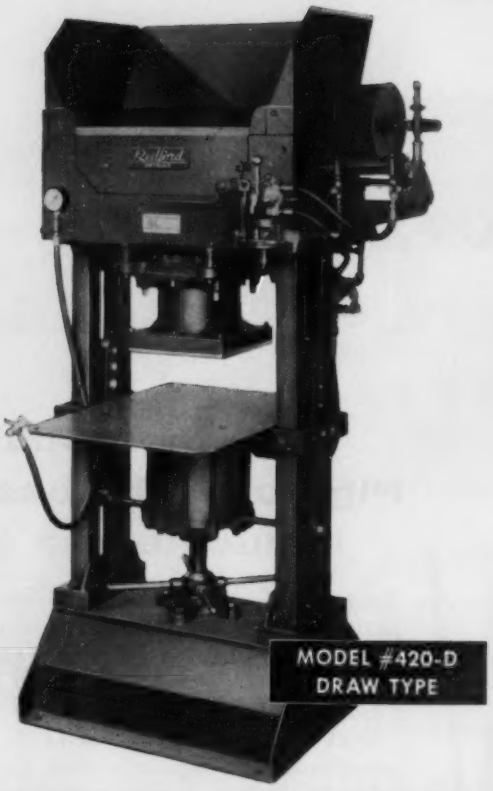
Circle 581 on Page 55



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Circle 583 on Page 55

PMD . . . and the Direct Chill casting method

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Direct chill casting is accomplished by pouring molten metal into an open end, water cooled mold that is closed at the bottom by a movable block. As the metal solidifies sufficiently to form a skin, the bottom block is lowered at a controlled rate and the direct chill casting is in process. A wide variety of shapes and forms is possible to cast in bar lengths replacing individual castings, resulting in considerable savings in machining and fewer rejects because of casting flaws.

Permanent Mold Die Company is a pioneer in the direct chill casting process. Through the research facilities of PMD, better casting methods are constantly being devised . . . methods that insure higher quality castings at lower costs. And remember, a Permanent Mold Die Co. engineer is available to anyone having die casting or tooling problems.

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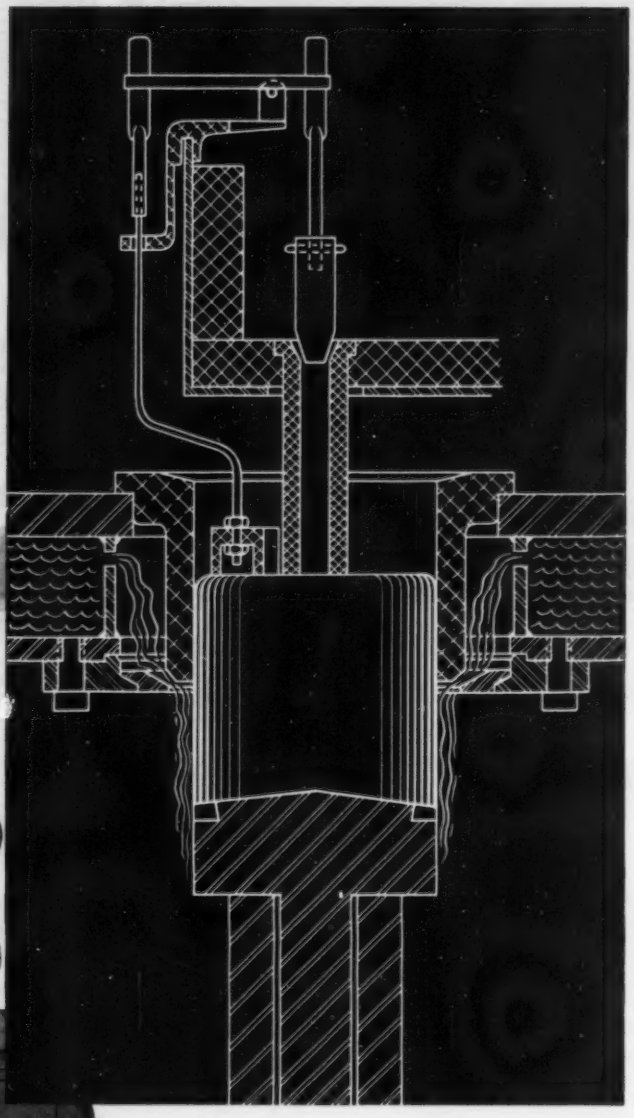

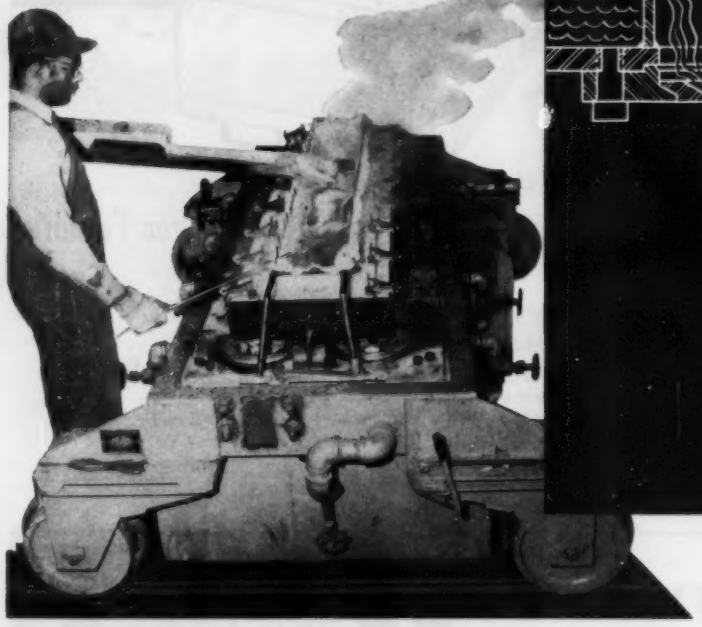

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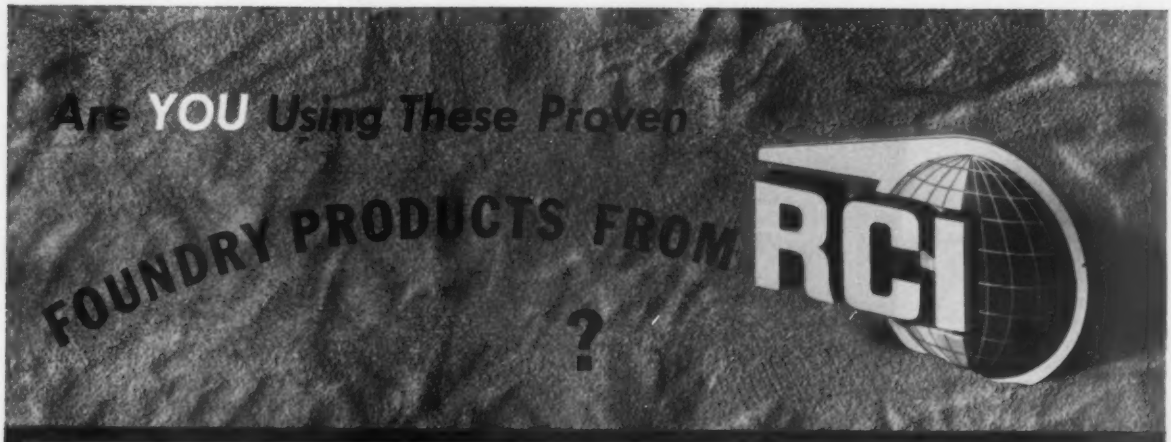

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FOUNDREZ 7600 Series	Liquid Resin		Rapid Collapsibility Fast Bake
CO-RELEES 7300 Series	Oil		Excellent Sand Conditioning
coRCIment 7900 Series	Oil		Broad Baking Range Excellent Workability
FOUNDREZ 7150 Series	Liquid Resin	SHELL MOLDS AND CORES	Unusual Stability
FOUNDREZ 7500 Series	Granulated & Powdered Resin		High Tensile Strength Low Gas
COROVIT 7200 Series	Oil & Powdered Accelerator	SELF-CURING	Controlled Curing
REICOTE 7800 Series	Solvent	SAND COATING	Exceptional Coating Speed

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Thor POWER TOOLS

Circle 586 on Page 55

THEY SAID, *"It couldn't be done!"*

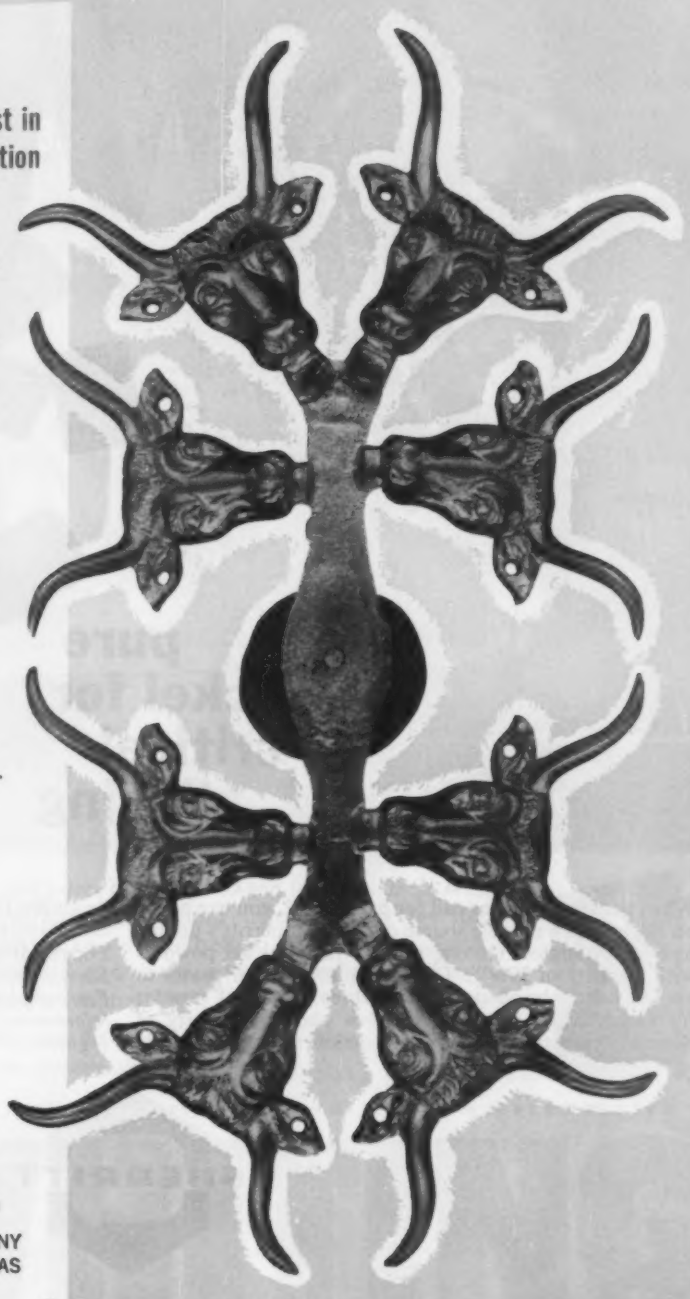
Aluminum Alloy "Steer Heads" were Cast in PETRO BOND* sand at 1960 AFS Convention

Cast in a foundry? No! The casting shown on this page is an unretouched photo of the casting poured at—of all places—*the Baroid Chemicals Booth at the 1960 AFS Convention!*

If you attended the 1960 Convention, you may have taken home one of these "Steer Head" holders. If you didn't attend the Show . . . or didn't visit Baroid Chemicals' Booth . . . you missed one of the most unusual foundry feats ever accomplished.

The entire operation—sand preparation, molding, pouring and shake-out—was performed in public. The molds were made by a student molder who had never before worked with PETRO BOND sand.

Take a good look at the casting illustrated on this page. Notice the smooth finish, the absence of pin-hole porosity. These "Steer Heads" were cast in PETRO BOND sand. PETRO BOND is a formulated sand-bonding agent used with oil instead of water. PETRO BOND produces precision castings with conventional foundry equipment—*anywhere!*



BAROID

BAROID CHEMICALS, INC.

A SUBSIDIARY OF NATIONAL LEAD COMPANY
1809 SOUTH COAST BLDG. HOUSTON 2, TEXAS

*Registered Trademark, National Lead Company

1609

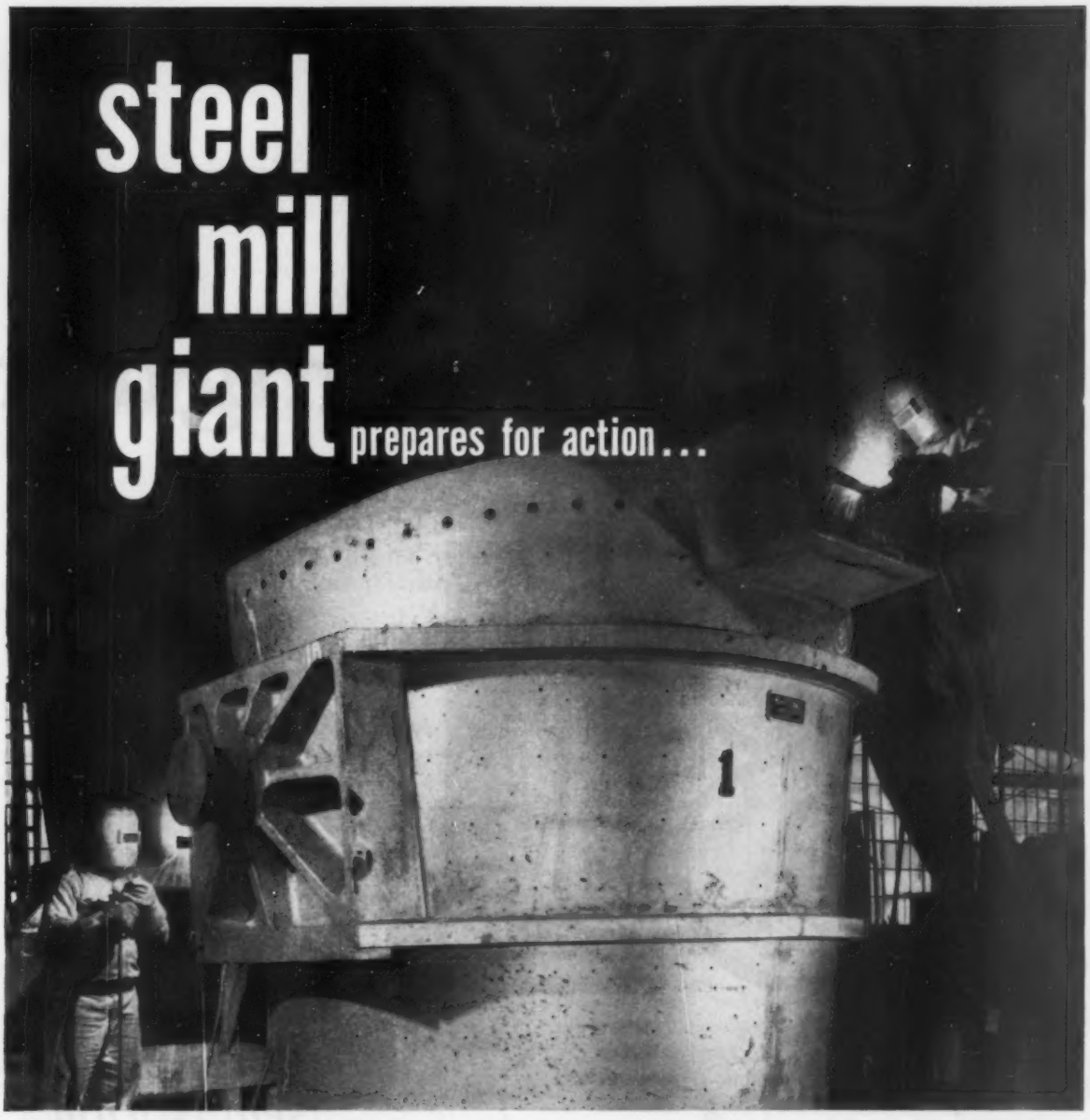
Circle 587 on Page 55

pure nickel for critical alloying

When the specifications call for *pure* nickel, you can count on Sherritt as a reliable source of supply. Sherritt's unique hydrometallurgical refining process yields nickel powders with a purity of 99.9%. This high-purity nickel comes to you in handy briquettes and in three grades of powder for faster, easier alloying. The low chilling property of Sherritt briquettes and powders makes them particularly desirable for alloying additions at the end of the heat. Special nickel grades and coated powders are also available. FOOTE MINERAL COMPANY *is the exclusive sales agent for Sherritt nickel and cobalt in the United States and Canada. For complete illustrated brochure with prices and delivery information, contact the Foote Mineral Company, 473S Eighteen West Chelten Building, Philadelphia 44, Pa.*

SHERRITT GORDON MINES LIMITED

steel mill giant prepares for action...



Preparations are nearly complete . . . and soon this giant 60-ton ladle, built to A.I.S.E. specs, will be pouring out profit for another satisfied Whiting customer. Cast steel trunion bases, forged steel trunions, and adjustable swivel-type bottom tapping lever guarantee low maintenance . . . easy control . . . long, rugged service life. When you need ladles—capacities from 100 lbs. to 200 tons—specify Whiting!

FREE CATALOG . . . Describes over 200 ladle types and sizes. Write today!
Whiting Corporation, 15607 Lathrop Avenue, Harvey, Illinois.

COST-SAVING EQUIPMENT . . . THE WAY TO HIGHER PROFITS

LADLES **WHITING**

MANUFACTURERS OF CRANES; TRAMBEAM HANDLING SYSTEMS; TRACKMOBILES; FOUNDRY, RAILROAD, AND SWENSON CHEMICAL EQUIPMENT

Circle 589 on Page 55

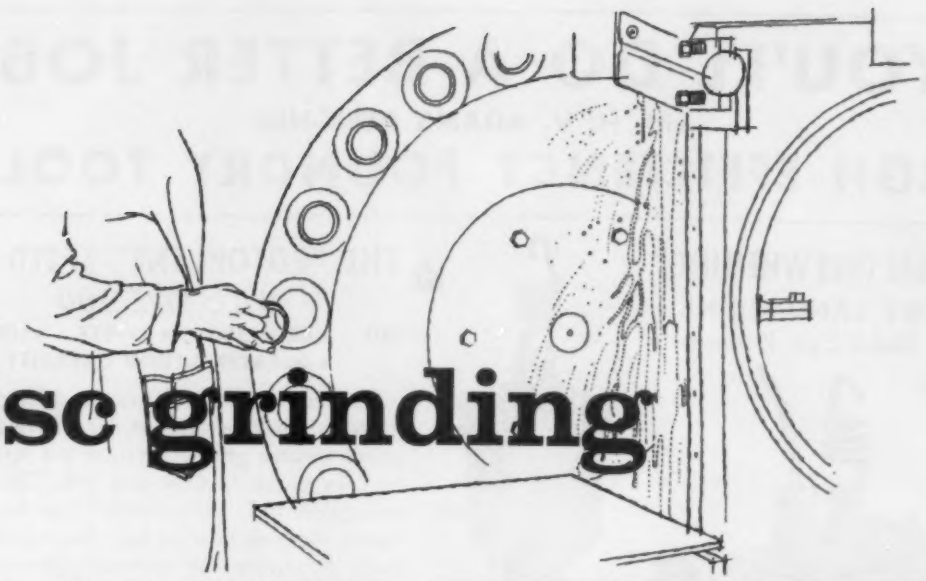
Announcing:

A new high in

set by

B14

New Norton Resinoid Bonded DISCS



disc grinding

Under development and testing for two years . . . now available as the finest discs of their type ever made.

At Norton, product development never ends — either as a policy of leadership or as a continuous source of new advantages to industry in every type of grinding.

The latest news-making achievement in Norton product development is the B14 resinoid bond for disc wheels.

Development of the B14 bond involved not only improvements in bond material but entirely new processing.

It took several years to perfect these changes. It also took many months to complete nationwide testing of the new B14 discs, on all types of disc grinders — horizontal or vertical spindle, single or double — on jobs ranging from snagging to precision finishing, and on ferrous, nonferrous and non-metallic materials. Also, the tests were entirely comparative — not only against competitive wheels but against Norton discs which were then standard.

Results of this across-the-board testing are outstanding. The new B14 discs have proved beyond question their ability to grind more workpieces per disc . . . faster and better, with fewer dressings . . . and with constant uniformity throughout extra long disc life.

Let new B14 discs bring *you* proof of better, lower cost surfacing. Have your Norton Man, a trained Abrasive Engineer, study your requirements and make trial runs of the B14's you need — solid discs or segmental, ALUNDUM* or CRYSTOLON* abrasive. Or get details from your Norton Distributor. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries

A few of very many reports from Norton customers . . .
PROVING B14 DISCS THE BEST

JOB: Rough grinding iron castings, 3½" x 2½".

REPORT: **B14 37 CRYSTOLON wheel ground 6,000 parts with one dressing. Best previous disc gave 4,500 parts with 4 dressings.**

JOB: Surfacing cold rolled steel washers on double disc machine.

REPORT: **B14 19 ALUNDUM discs impressive as best so far, with very even wear.**

JOB: Through-feed grinding of 52,100 steel bearing races.

REPORT: **B14 ALUNDUM disc very free cutting, clean and cool. Longer life than previously used Norton disc.**

JOB: Double-disc grinding Alnico magnets.

REPORT: **B14 mixed-abrasive wheel thoroughly approved for new orders.**

JOB: Double-disc grinding abrasive sticks.

REPORT: **B14 37 ALUNDUM disc gave improved rate of cut. More abrasive sticks per disc-dressing.**

JOB: Rough grinding miscellaneous parts on double end machine.

REPORT: **B14 44 ALUNDUM disc performed better, lasted longer than all types.**

NORTON
ABRASIVES

W-1951

75 years of . . . Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

YOU'LL DO A BETTER JOB

with H. V. ADAMS DESIGNED

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.

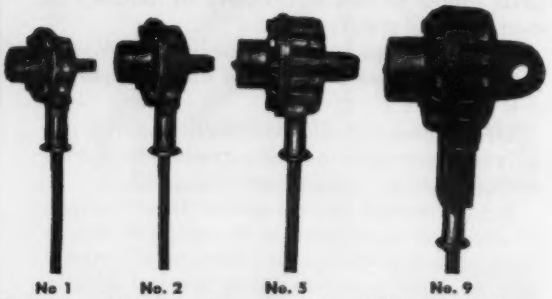
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

• SPEED • ECONOMY • SAFETY • LONGER LIFE • GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area — are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 3 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- **No. 11 NOISELESS TYPE VIBRATOR**
- **A-20 ELECTRIC VIBRATOR**
- **RED ELECTRIC KNEE SWITCHES**
- **"ROTO" ADJUSTABLE BIN VIBRATOR**
- **2 MIN. UNIVERSAL FINENESS TEST SIFTER.**
- **UNIVERSAL TRIPOD CARRIER**

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 Cable Address: "Rotoplane Chicago" H. V. ADAMS, Mgr.

Circle 593 on Page 55 Circle 591 on Page 55→

Smart fellow — that Satan! He's found out our Koppers Premium Foundry Coke maintains a higher temperature range and keeps operating costs way down. Naturally he wants to order some.

But we wouldn't sell him. We sell only the *good* guys. We've found that once we have sold them — they *stay sold* and remain good customers of ours forever and ever.

The reasons are quite simple: Koppers Coke is prepared from the very best quality West Virginia coals, skillfully blended and baked the right length of time. It is absolutely uniform in *size*, *strength*, *structure* and *chemical analysis*. (We check each day's run to be sure.) And because of its superior physical qualities, its high carbon and low ash, Koppers Coke enables foundrymen to maintain higher temperatures which increases the cleanliness of the iron and helps cut fuel consumption.

Just for the devil of it, why don't you make your next order Koppers Premium Foundry Coke? It's available anywhere in the U. S. or Canada in sizes to fit your needs. Koppers Company, Inc., Pittsburgh, Pennsylvania.

Koppers Premium Foundry Coke

NEW ELPAR ACRO-SMOOTH

with these most wanted features...

- **Smooth stepless speed control**
- **Easy, low cost maintenance**
- **Increased work output**

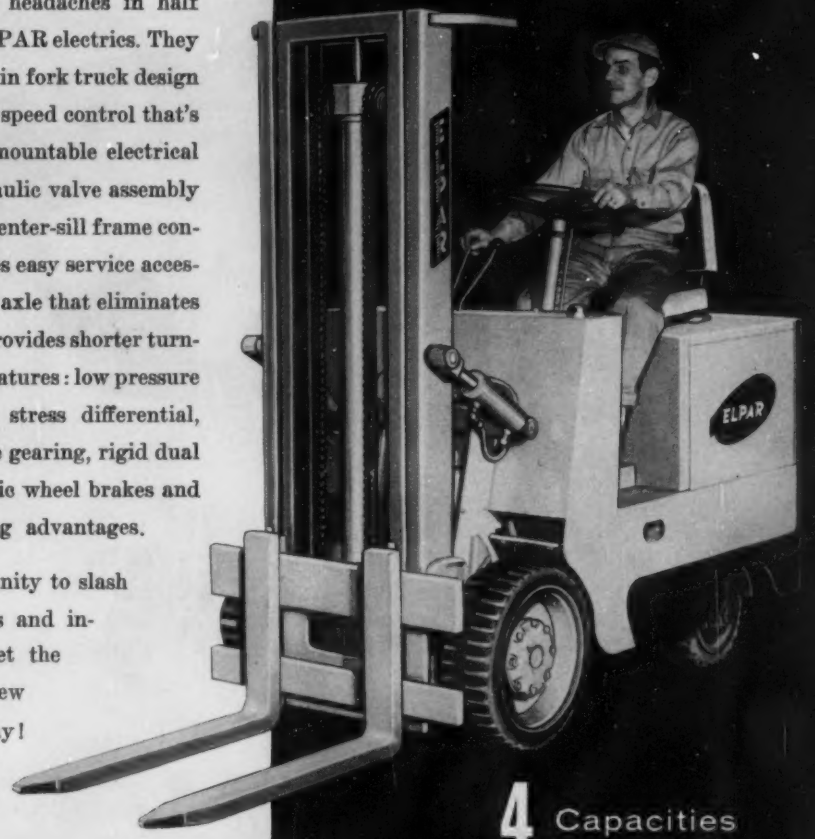
Cut your maintenance headaches in half with this new line of ELPAR electrics. They represent a new concept in fork truck design with . . . a new step-less speed control that's simple to maintain; demountable electrical control panel and hydraulic valve assembly for fast bench repairs; center-sill frame construction that guarantees easy service accessability; caster steering axle that eliminates steering knuckles and provides shorter turning radius. Plus these features: low pressure hydraulic system, low stress differential, completely housed drive gearing, rigid dual tilt mountings, hydraulic wheel brakes and many more cost cutting advantages.

Don't miss this opportunity to slash your maintenance costs and increase productivity. Get the facts on ELPAR's new "Acro Smooth" line today!

Send for This New Folder—get complete details on this new line of ELPAR electric fork trucks.

THE ELWELL-PARKER ELECTRIC COMPANY
4312 ST. CLAIR AVE. • CLEVELAND 3, OHIO

Slash Truck Maintenance 55%



4 Capacities
Individual models for 4,000, 5,000, 6,000 and 7,000 lbs.

ELPAR
ELECTRIC TRUCKS

Circle 592 on Page 55

FOUNDRY

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Advertising content is classified by subject and listed by page number for your convenience when studying specific foundry applications. For further information on subjects advertised, refer to advertisement on the page indicated and circle Item Number on Reader Service Card —Page 55.

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CLEVELAND, OHIO

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"SUPER-STEEL"

STEEL SHOT *and* GRIT

$165.00

per ton
in truck loads

A revolutionary new process for producing steel shot makes it possible for METAL BLAST to offer substantial savings to *all plants using steel abrasives.* This new process turns out steel shot much more economically than the conventional process used by others — and savings are passed along to consumers!

"SUPER-STEEL" abrasives are strictly top quality and perform as top quality abrasives should — in cleaning action, in number of passes and effect on equipment. In fact, we'll give you a written, *money-back guarantee* that "SUPER-STEEL" will equal the performance of any steel abrasive now on the market.

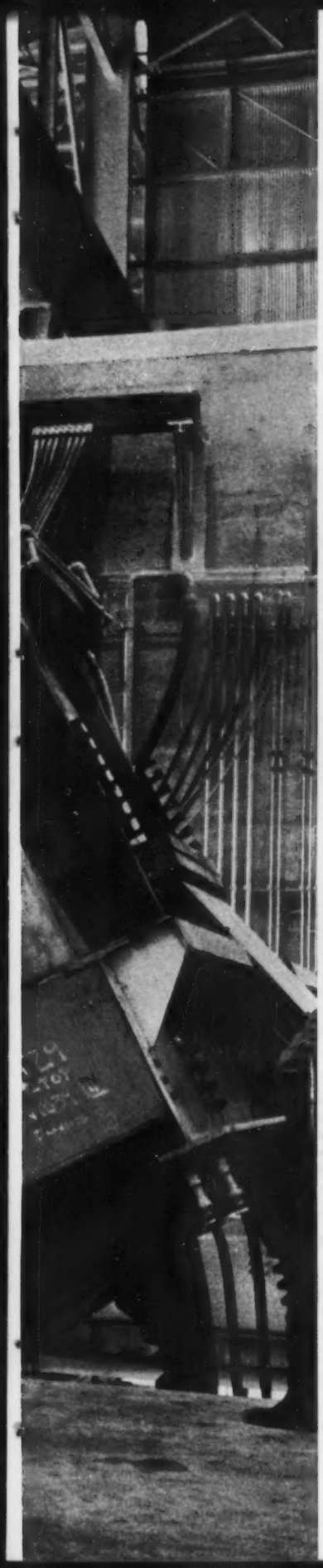
Here's an opportunity to save many important dollars on steel abrasives. Why not at least investigate? Write, wire or phone (collect) for full information and sample.

METAL BLAST, INC.

872 EAST 67th STREET • CLEVELAND 3, OHIO • Phone: EXpress 1-4274

ALSO IN: Chattanooga • Chicago • Cincinnati • Dayton • Detroit • Elberton, Ga. • Grand Rapids • Greensboro, N. C. Houston • Los Angeles • Louisville • Milwaukee • Minneapolis • New York • Philadelphia • Pittsburgh and St. Louis.

MANUFACTURERS, ALSO, OF TOP QUALITY "SEMI-STEEL" SHOT AND GRIT, MALLEABLE AND CHILLED SHOT AND GRIT — AT COMPARABLE SAVINGS!



This Heroult Electric Furnace does the most efficient steel melting job at Lukens Steel

Two years ago, Lukens Steel Company installed this 20-foot diameter Heroult in their Coatesville Plant. It's a standard Heroult top-charge, swing-roof furnace with a nominal capacity rating of 100 tons. In almost continuous operation since installation, producing ordinary carbon and low-alloy steels, the Heroult's performance has proved the matchless efficiency of electric melting.

The Heroult is 100% mechanically operated. All movements are motor-driven gear mechanisms. This reduces maintenance problems, and permits your own maintenance crew to keep it performing with a minimum of effort. The Heroult has other features such as cage-type shell construction, independently supported operating mechanism, and water-cooled skewback roof ring. They all help to make the Heroult the finest electric melting furnace available.

Heroult Electric Arc Furnaces are available in shell diameter sizes from 7'0" up, and with a rated charge capacity from 4 tons to over 200 tons. You can select door-charge or top-charge swing roof type. We'll also furnish special induction stirring equipment, duplexing arrangements, and furnaces for melting of copper and nickel.

American Bridge has the facilities and the technical know-how to handle a complete melt shop installation. This includes design, construction and installation of machinery. For complete information, get in touch with the contracting office nearest you. Or write to our Pittsburgh Office.

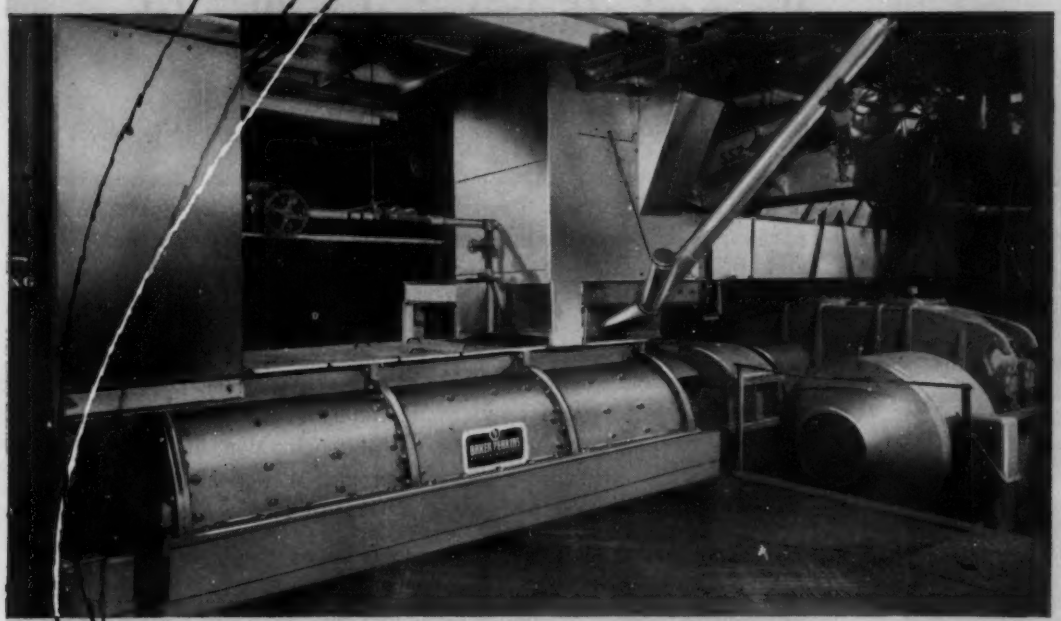
USS and Heroult are registered trademarks

American Bridge Division of United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pa.
Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Ore. Roanoke • St. Louis • San Francisco • Trenton • United States Steel Export Company, New York

Circle 595 on Page 55

NOW . . .
a single B-P Continuous Muller handles 300 tons of sand per hour



The new Baker Perkins Size 8 Muller, now in successful operation in one of the midwest's automotive foundries, has 300% more hourly capacity than any available batch type muller and 100% more capacity than the next size B-P continuous unit. As with all B-P Continuous Mullers, cleaner, smoother castings are obtained with fewer rejects because molding sands are thoroughly mixed and tempered. The special Sigma-type agitators assure that each grain of sand is coated with the correct proportion of bond.

Baker Perkins builds Continuous Mullers in capacities from 30 to 300 tons per hour. Because of their rigid, rugged construction, B-P Continuous Mullers give many years of service. Installations in many of America's largest foundries have proven the efficiency of Baker Perkins Continuous Mullers under the most exacting conditions.

For further information about B-P Continuous Foundry Sand Mullers and B-P Unidor mixers for core and special process sand mixing, send for catalog No. F-156.

371

BAKER PERKINS INC.

FOUNDRY MACHINERY DIVISION • SAGINAW, MICHIGAN

X marks the trouble spot in seconds!

Xeroradiography cuts x-ray inspection time and cost! With this revolutionary method, radiographs are obtained electrostatically — images *dry* and ready to read less than a minute after exposure. A characteristic phenomenon called "highlighting" *automatically emphasizes discontinuities*—will show up defects indiscernible by other means. Here at last you find both *radiographic detail* and *high exposure speed* rolled into one!

Xero (zero) radiography is beyond doubt the long-awaited answer for many industries seeking fast, economical production-line x-ray inspection. Proved applications range from tire manufacturing to the production of extruded metal tubing, and it is particularly valuable in the *foundry* for inspecting light alloys. One prominent aircraft manufacturer* reports 25% cost savings with xeroradiography and is strongly urging its vendors to use it.

For complete details on xeroradiography, contact your local G-E x-ray representative now . . . or write to X-Ray Department, General Electric Company, Milwaukee 1, Wisconsin, for Pub. YY-94.

*Name available on request.

Progress Is Our Most Important Product

GENERAL ELECTRIC

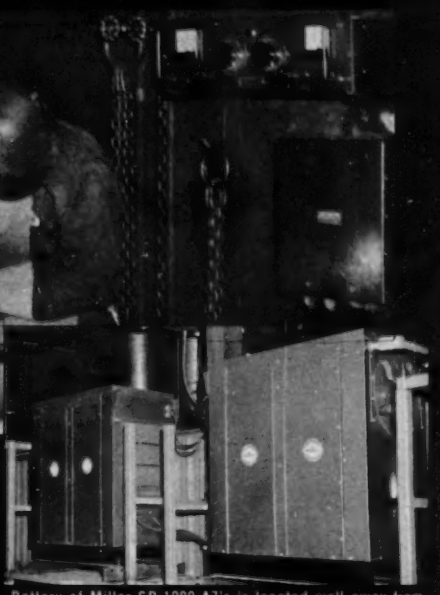
Circle 597 on Page 55

Foundries Find

miller-powered carbon arc cutting

Faster — Cheaper — Better

These photos, taken in well-known foundry, show operator carbon-arc cleaning a casting using an Arcair torch powered by a Miller SR-1000-A7. Note handiness of control console.



Battery of Miller SR-1000-A7's is located well away from cleaning room.

THE MILLER MODEL SR-1000 series, providing 1000 amperes of d-c at 40 arc volts, 100% duty cycle, has proved to be the ideal power source for Arcair and other foundry carbon arc cutting processes. Designed and built around Miller's exclusive semi-metallic, completely sealed Gold Star rectifier, drastic overloads are handled routinely without failure or deterioration. Control console is instantly removable to any reasonable distance. Adjustment of current range from 200 to 1400 amperes is accomplished under load. What's more, the operator can switch in a flash from cleaning and gouging to welding when needed. Operates from three phase power lines.

For applications involving carbon arc cutting, heavy submerged arc welding, plasma jet and electric furnace processes, the Miller SR-1000 series is probably without an equal. May we send you more complete details and specifications?

MODEL SR-1000-A7

miller ELECTRIC MANUFACTURING COMPANY, INC.

Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

APPLETON, WISCONSIN

From first heat to heat treat . . .

LOFTUS

designs and builds them better

International Harvester Corp., West Pullman Works

COVER TYPE ANNEALING FURNACES

DIRECT-FIRED SINGLE-STACK

Generally Recommended
for
Greater Productivity per Investment Dollar
and
Flexibility with Economy

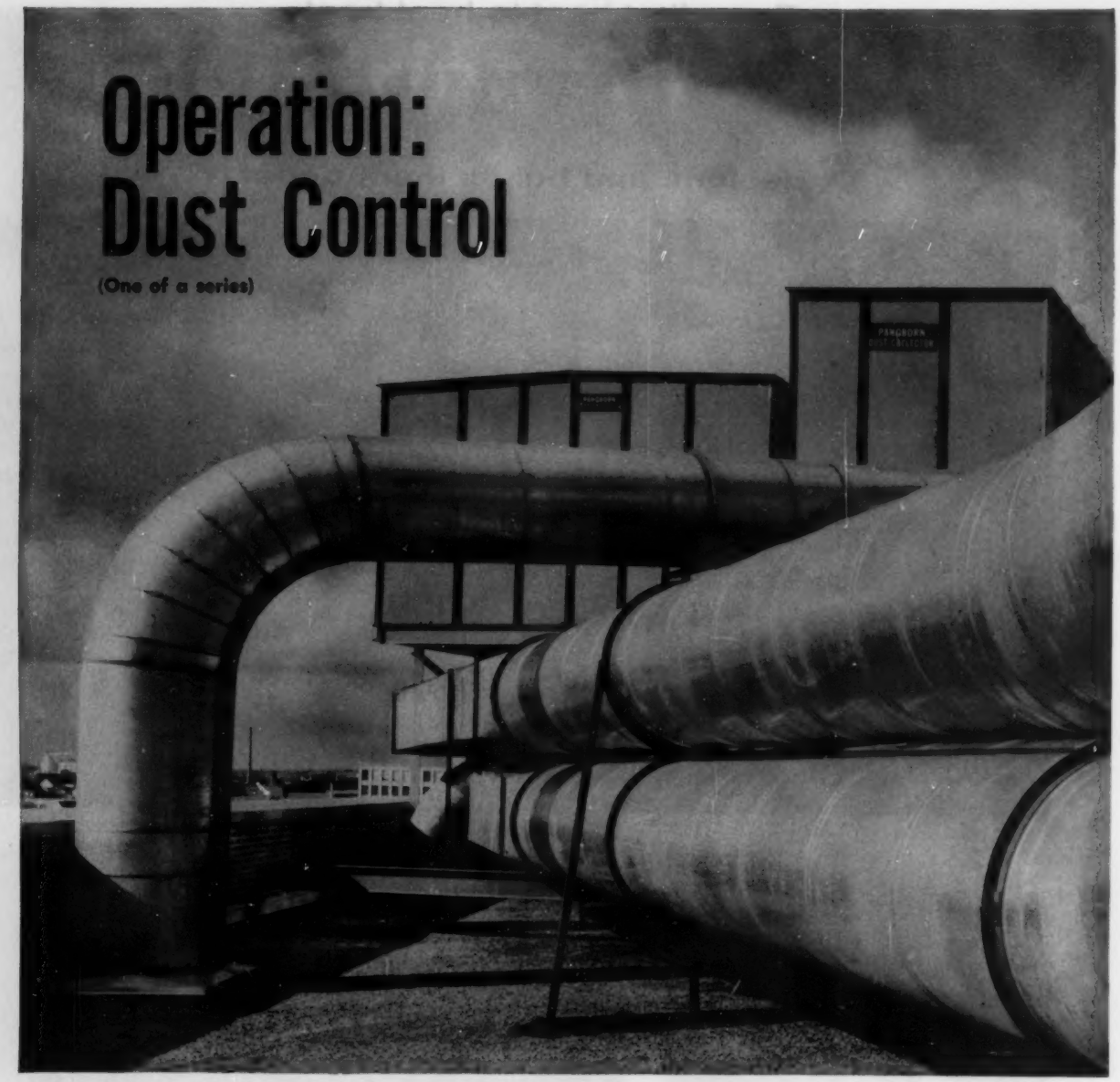
When warranted by special conditions, radiant tube or multiple stack construction are also available.

LOFTUS
Engineering Corporation
1 Gateway Center, Pittsburgh, Pa.

57.12.4A

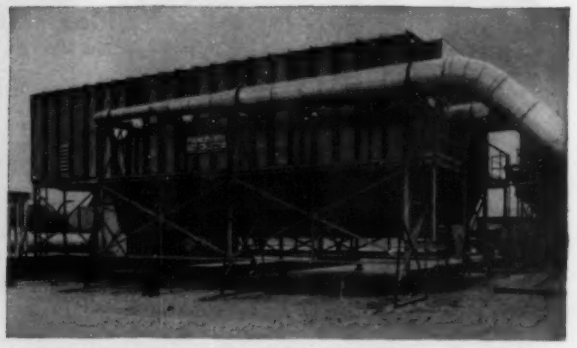
Operation: Dust Control

(One of a series)

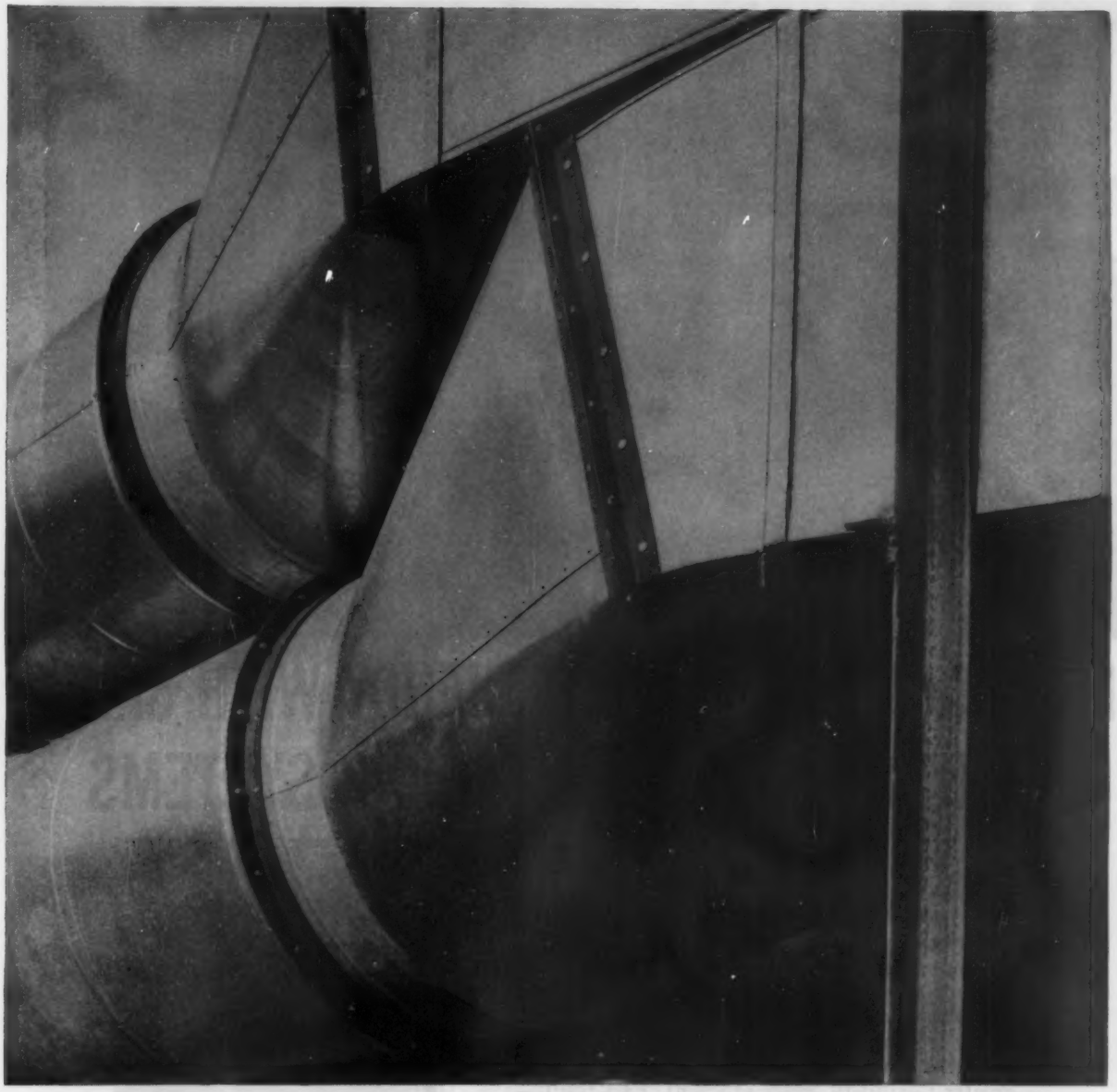


At National Cash Register, 10 tons of wood

Dust is trapped at the source by hoods engineered for the individual job . . .



. . . and is piped from 160 locations to five giant Pangborn Cloth Bag Collectors.



shavings, chips and dust are collected daily!

Mammoth is the word for the 5-floor woodworking plant of National Cash Register headquarters, Dayton, Ohio. Processing nearly 300,000 sq. ft. of lumber each month, this operation generates 10 tons of waste material per day.

To protect NCR employees, equipment, plant and neighborhood, five Pangborn Cloth Bag Dust Collectors trap 90 cu. ft. of fine dust for disposal and, during the winter months, permit recirculating of the already-heated, cleaned air. This efficient performance of Pangborn Dust Control saves thousands of dollars in heating costs during the cold weather. In addition, a neighborhood and health nuisance has been eliminated; equipment maintenance and plant housekeeping costs have been minimized.

Dust a continuing problem in *your* plant? Talk to the Pangborn man in your area or write: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control, Blast Cleaning, Vibratory Equipment—Rotoblast® Steel Shot and Grit.®*

Pangborn
OF HAGERSTOWN

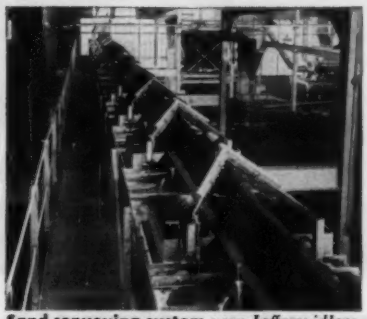
Circle 600 on Page 55

INCREASE FOUNDRY EFFICIENCY WITH SAND HANDLING AND CONDITIONING SYSTEMS

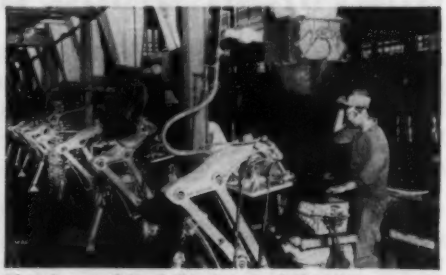
Jeffrey's experience in mechanizing foundry operations covers *your* specific operating conditions.

For example, in handling and conditioning sand, a complete system for handling sand from the molders' stations through pouring, shakeout, conditioning and back to the molders can pay off for the large-run foundry in a short time. Other foundries find a semi-continuous system, with its greater flexibility, more efficient. End result—greater efficiency, stepped up output in existing floor space.

Jeffrey starts with your basic requirements—engineers the right conveying and processing equipment, erects the equipment if desired. Consult Jeffrey for cost-cutting throughout your operations...Sand Handling and Conditioning Systems, Mold Preparation and Handling Equipment, Castings Handling Equipment, Special Unit Machines. For illustrated Catalog 911 write, The Jeffrey Manufacturing Company, 907 North Fourth St., Columbus 16, Ohio.



Sand conveying system *uses Jeffrey idlers for minimum-maintenance service.*



Time is saved *by delivering sand directly to molders' stations.*

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY... CONTRACT MANUFACTURING

JEFFREY

Circle 601 on Page 55

Another MX Test System at work...

Testing wall thickness for casting core shift. Arthur Lindgren, Magnaflux Field Engineer, works with Floyd Mortimore, chief inspector and Edward Moody, inspector, Harrison Steel Castings Company, Attica, Indiana.

Core Shift?

New Transistorized Dial-Reading, Portable Ultrasonic Test Unit Tells You Instantly

Time and labor saving is great in checking for core shift. You eliminate drilling holes and hole repair, and the use of intricate calipers, by measuring directly *through* the metal.

Testing from one side only, the all-new, transistorized SONIZON SO-300, tells you the exact wall thickness of your castings as fast as a probe can be moved over the outside surface: on steel, cast iron, aluminum, magnesium or any alloy material. It is the portable, battery-powered ultrasonic test unit providing direct dial-reading of thickness.

The SO-300 is lightweight, only 12¼ lbs., with impact-proof case. Accuracy is ±1% when calibrated against known sample. Just select your range and turn a dial.

For more information or demonstration, phone our local Field Engineer or write to Magnaflux Corporation, 7350 W. Lawrence Avenue, Chicago 31, Illinois.

MAGNAFLUX CORPORATION

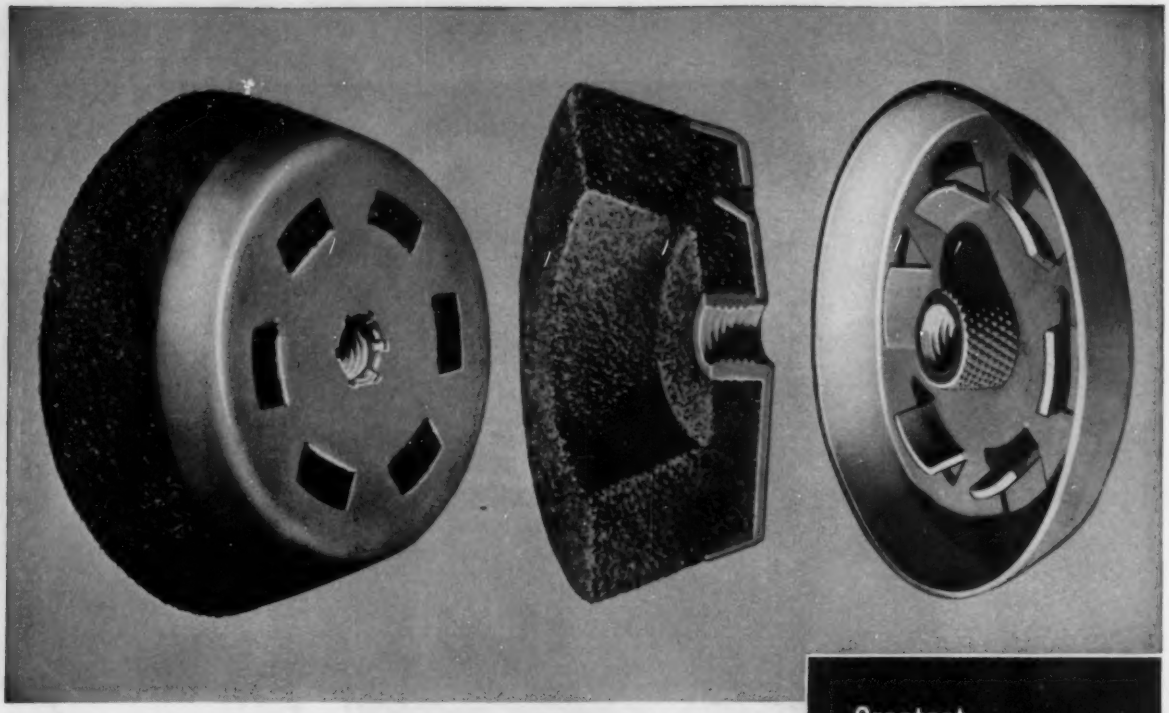
A SUBSIDIARY OF GENERAL MILLS

General Mills

TEST SYSTEMS

MX Test Systems Include MAGNETIC PARTICLE, FLUORESCENT PENETRANT, THERMOGRAPHIC, EDDY CURRENT, ULTRASONIC, STRESS ANALYSIS, RADIOGRAPHIC TESTING, DYE PENETRANT & MAGNETIC FIELD

Circle 602 on Page 55



MANHATTAN

THE ORIGINAL *SAFETY BACK* FLARED CUP

The first wheel to offer the exclusive features of the Safety Back Flared Cup! This totally new concept of design *and* construction puts portable wheel *safety* where it counts the most — in *original* strength and breakage resistance! With Safety Back, steel covers the entire back of the flared cup . . . extends down the side to assure a degree of reinforcement never before available with anchor bushings, safety rings, special hub mountings or ordinary revolving cup guards.

You can't get a safer wheel to use . . . and you can't find a better performing wheel to use on your portable grinders. Every Manhattan Safety Back Flared Cup is custom-bonded with the right abrasive for *faster* removal of *more* metal on your particular job — at no extra cost!

For faster cutting, longer lasting, *safer* abrasive wheel performance — "More Use per Dollar" — be certain you get the original Manhattan Safety Back Flared Cup. Let your Manhattan abrasive wheel engineer show you the exclusive advantages of this and other Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

- Greatest Initial Strength
- Easy Mounting — Easy Operation
- Highest Safety Factor
- Requires No Adjustment
- One Piece Assembly
- Improved Mounting Base

"MORE USE PER DOLLAR"

ENGINEERED RUBBER PRODUCTS . . . MORE USE PER DOLLAR

RM

RM 1069

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION • PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Circle 603 on Page 55

KNOWN CHEMICAL PROPERTIES. Every melt of Olin Aluminum undergoes exacting metallurgical and production controls.

DEPENDABILITY OF SUPPLY. Every Olin Aluminum customer is the terminal point of a fully integrated chain of supply.

CASTING PROBLEMS? CALL OLIN ALUMINUM FOR TOP-FLIGHT TECHNICAL SERVICE

Like V.I.P. service anytime, every time? Our Customer Requirement Record is the most detailed in the business. Fast-moving Olin Aluminum keeps right in step with **your** quality requirements and production schedule.

Want assured supply? Olin Aluminum's policy is to allot a large percentage of its output to casting alloys. Our customers can depend on us, whether metal is generally plentiful or scarce.

Are you a tough customer when it comes to quality in the metal you buy? Olin Aluminum casting alloys are just what you've been looking for. We supply primary metal of the highest purity coupled with excellent grain refinement, enabling you to obtain better physical properties in your castings.

MORE EFFICIENT FORMS. Olin Aluminum casting alloys come in 10, 25, and 50-lb. sizes. Ten and 25 pounders feature smaller size to facilitate crucible charging, speed handling and melting. Deep notches and 4-section design for easier breaking.

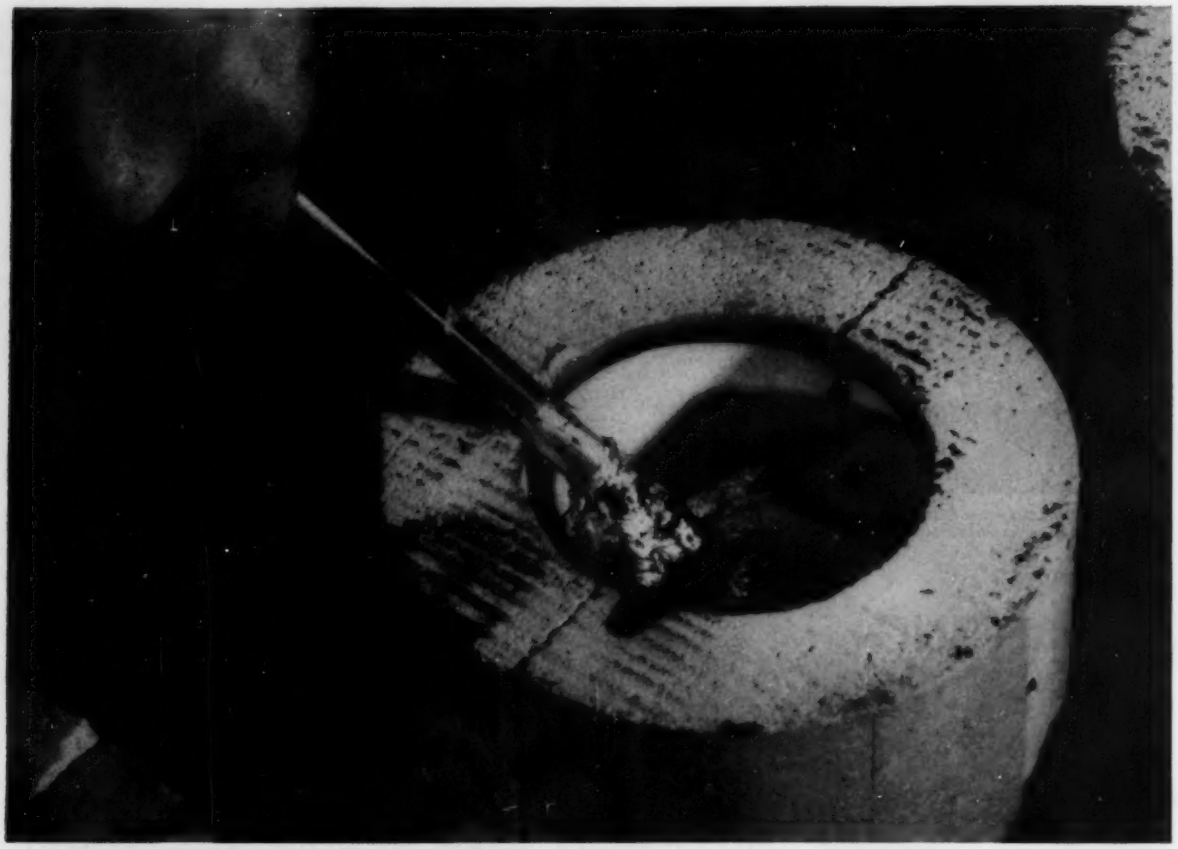
Remember, Olin Aluminum doesn't sell castings; we simply want to help you to produce better castings. For quality, service and dependability — call your Olin Aluminum office or distributor.

Member, American Foundrymen's Society

OLIN MATHIESON • METALS DIVISION • 400 PARK AVENUE • NEW YORK 22, N. Y.

OLIN ALUMINUM

Circle 604 on Page 55

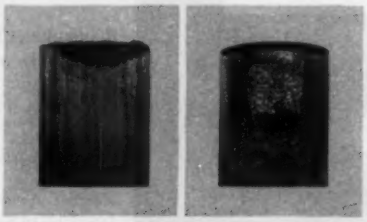


Riser metal stays molten twice as long with J-M RIS-A-SLEEV

THE INSULATED RISER SLEEVE FOR NON-FERROUS METALS THAT ASSURES UNIFORM FEEDBACK TO EVERY PART OF THE MOLD

Now you can get perfect finished castings every time with Johns-Manville Ris-A-Sleev®, the new riser sleeve that cuts heat transfer in half. The heat is contained *in the sleeve,* keeping the metal molten twice as long as the most effective competitive product. This allows more time to complete feed-back.

Ris-A-Sleev's more effective insulation serves to reduce the size of the risers, thereby giving you closer control of solidification. What's more, smaller risers mean a big reduction in cut-off waste. The following photographs graphically demonstrate Ris-A-Sleev's superiority over a leading competitive product.



Under identical test conditions, brass pourings were made with a Ris-A-Sleev and an ordinary riser sleeve. Note how riser metal from the mold equipped with a Ris-A-Sleev (left) has solidified uniformly with very little concavity, indicating uniform feedback to mold. Then note how the riser from mold using competitive sleeve (right) has cooled quickly around circumference, while center of riser stayed molten, resulting in pronounced concavity and uneven feedback.

Try Johns-Manville Ris-A-Sleev and discover the economic way to improve bronze, brass and aluminum castings. They are available in a complete range of sizes. For full information write Johns-Manville, Box 14, New York 16, N. Y. Ask for brochure IN-247A.

JOHNS-MANVILLE

AN INSULATION FOR EVERY COMMERCIAL AND INDUSTRIAL USE

JOHNS-MANVILLE JM PRODUCTS

Circle 605 on Page 55

METALGRAMS

. . . news of "Electromet" ferroalloys and metals

UNION CARBIDE METALS

Electromet brand ferroalloys, pure metals and metal chemicals

SEPTEMBER, 1960

HIGHER DUCTILITY WITH CALCIUM-SILICON -- Two Midwestern steel foundries recently obtained data on Grade B steel castings made with and without calcium-silicon. In one test of 91 production heats, all of the heats treated with calcium-silicon and aluminum produced castings with satisfactory ductility. As a comparison, over 25 per cent of the heats deoxidized only with aluminum failed to meet reduction-in-area specifications. In another test of 20 production heats, a 15 to 20 per cent improvement in ductility (% RA) was reported.

* * *

BETTER FLUIDITY TOO -- American Hoist and Derrick Co., St. Paul, Minn., also reports improved fluidity of Grade B steel when treated with 6 lbs. per ton of calcium-silicon. Although they now pour several thin-sectioned castings in a single mold at lower temperatures than before, they have had no misrun castings. On a test of 58 production heats they also report 20 to 25 per cent improvement in ductility with the use of calcium-silicon. Further data can be obtained by writing for the article, "Calcium Improves Ductility of Steel Castings," in the Summer 1960 issue of UNION CARBIDE METALS REVIEW.

* * *

MORE ELECTROLYTIC MANGANESE -- To meet the increasing demand for "Elmang" electrolytic manganese metal, Union Carbide Metals has expanded its cell capacity by 20 per cent. Hence, a larger supply of this high-purity product (99.9 per cent minimum manganese) is assured for additions to steel, copper, and aluminum. Also of interest: (1) The metal is now available in 50-lb. bags for convenient, accurate additions. (2) The 600-lb. drums of "Elmang" manganese are now color-coded to allow easy identification of the regular, deyhydrogenated, and nitrogen-bearing grades. Write for new specifications sheet F-20,151.

* * *

SERVICE ON THE MOVE -- Every year, experienced metallurgists of UCM's Metallurgical Service Division travel tens of thousands of miles to customers' plants. Their mission: to provide on-the-site help on the use of ferroalloys and alloying metals in melting operations. As an example, a Metallurgical Service representative worked with Electric Steel Foundry Company of Portland in evaluating the new fast-dissolving "Simplex" ferrochrome in stainless steel. The joint effort showed that 5- to 7-minute savings in furnace time could be made per 2,000 lb. heat. For a detailed picture story of this cooperative service, write for "Service on the Move" in the Winter 1960 issue of UNION CARBIDE METALS REVIEW.

* * *

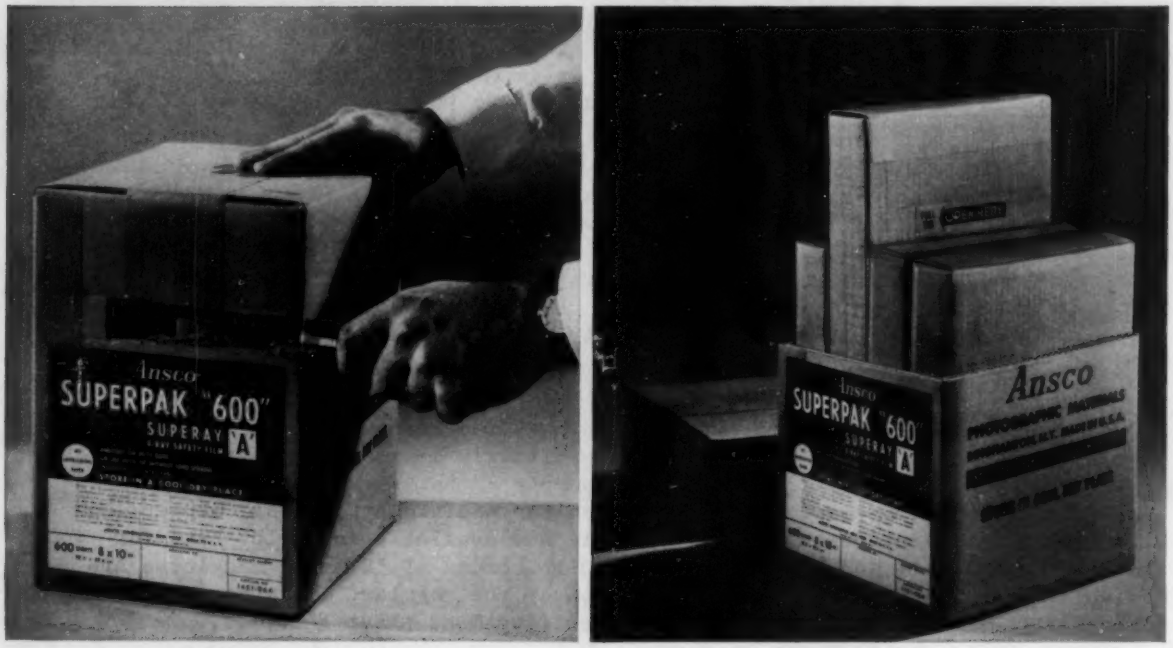
BETTER PROPERTIES FOR HIGH-STRENGTH IRON -- Foundrymen melting high-strength cast iron must keep their carbon low to minimize the weakening effect of graphite. By doing so, however, they often run into machining problems and low properties due to an abnormal structure. The remedy used by many foundrymen is "SMZ" alloy. This ladle addition improves machinability, promotes a uniform structure between light and heavy sections, and insures high-strength values. About 10 lbs. per ton are added to a 3 per cent carbon, 1.70 per cent silicon iron to get 40,000 to 50,000 psi. Write for F-4604C for more information.

* * *

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 270 Park Ave., New York 17, N. Y. In Canada: Union Carbide Canada Ltd., Toronto.

"Electromet," "Elmang," "Simplex," "SMZ," and "Union Carbide" are registered trade marks of Union Carbide Corporation.

NEW! ANSCO SUPERPAK



for the first time, a new x-ray film packaging that saves time and lowers costs at no sacrifice in quality.

Interrupting operations to open small quantities of X-ray film? Handling many small packages and wrappings? Never again with Ansco SUPERPAK. New Ansco SUPERPAK® is the modern way to increase your efficiency through 600 non-interleaved sheet or 300 interleaved sheet packages of Superay 'A' or Superay 'B'.

Whenever the storage bins (SUPERPAK fits standard film storage bins) need refilling, pause for a moment to open SUPERPAK, work on until the job is completed without further interruptions. Just think of the savings in man-hours and money through this new, sensible method of packaging.

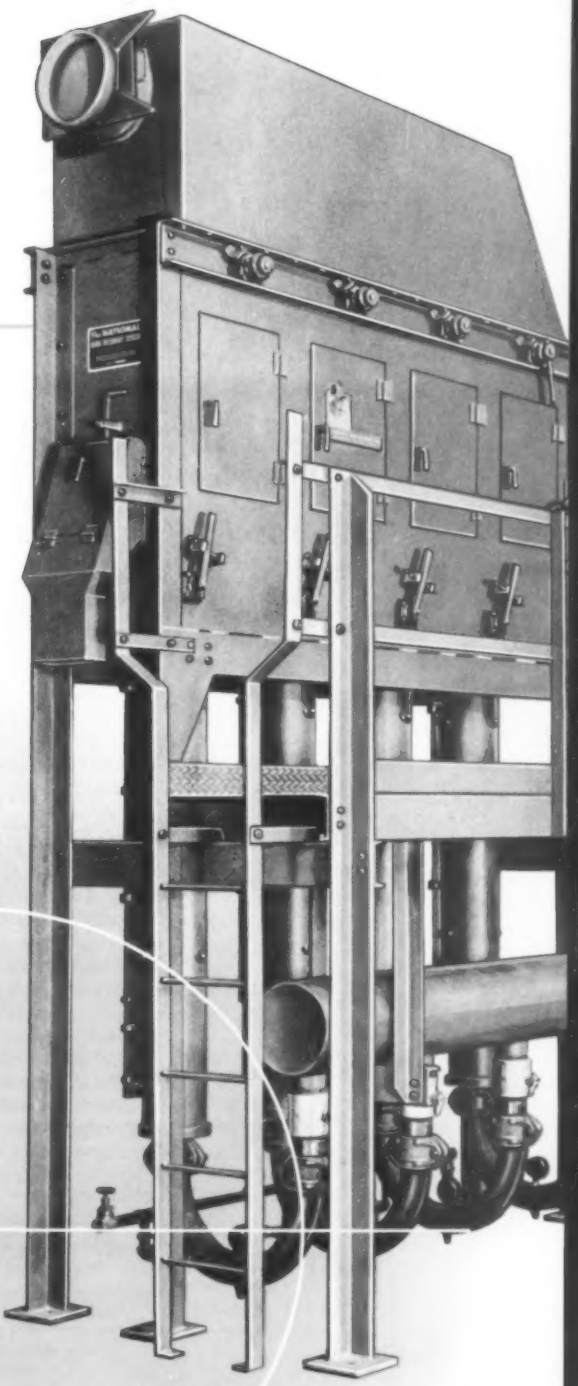
Ansco
Superpak

From every point of view; money, time and general efficiency . . . it makes sense to use SUPERPAK. Ansco, Binghamton, N. Y., A Division of General Aniline and Film Corporation, Manufacturer of World Famous Superay X-ray Films.

Circle 606 on Page 55
Circle 607 on Page 55→

Picture an item of foundry equipment that can:
. . . save you between $10,000 and $250,000 per year, yet is simple in design . . . has no moving parts in contact with the sand . . . operates continuously without supervision . . . has only one wear part and is in *everyday* use in over 60 foundries.

THIS IS THE NEW NATIONAL EVEN-FLO SAND SCRUBBER



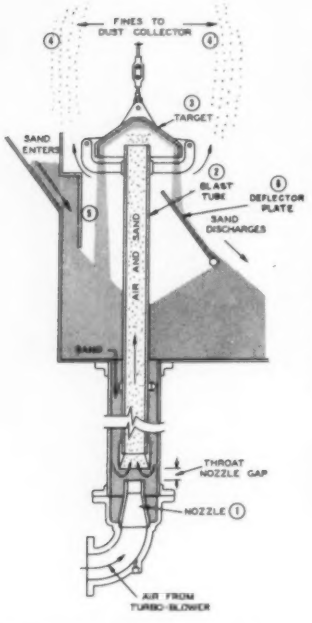
ON TARGET

TO REDUCE FOUNDRY COSTS

Circle 606 on Page 55

Circle 607 on Page 55→

THESE SAND RECLAIMING PRINCIPLES ARE PROVEN BY OVER 60 OPERATING UNITS



ON TARGET! PRINCIPLE

Even-Flo is unique in utilizing this basic physical principle: A constant force is **aimed** at an immovable object. The moving grains **must** lose all of their kinetic energy upon impact to provide maximum scrubbing action. It's like shooting ducks in a barrel— you can't miss—and you never waste a shot.

WHY RECLAIM SANDS?

In the not too distant future, most foundrymen will reclaim their shakeout sand just as they now remelt gates and risers . . . and for the same reason.

Pneumatic sand reclaiming *pays for itself* by reducing new sand costs up to 80%; eliminating or reducing the need for sand disposal and reducing clay and binder usage.

Yet, one of the most important features of the new National Even-Flo Sand Reclaiming System is that it permits the foundryman to improve both the quality and workability of his sand.

NEW SAND VS. RECLAIMED

It is evident that unreclaimed waste shakeout, even after "reconditioning," cannot be continuously reused for facing or core use. The grains become roughened, fused and enlarged (see cut). Excessive fines and size variation of grains reduces response to ramming, makes sand hard to work, difficult to control and contributes to thermal instability. Usability can be restored three ways: (1) Addition of *excessive binder and clay* — a practice that is expensive and not always effective; (2) *New sand make-up* — is more effective, but no less expensive; (3) *Pneumatic Sand Reclamation* — is the most *practical* as well as the most *economical* means of returning a sand grain surface to the condition where it will perform as well as new sand.

Many years of experience have proven that the surface characteristics as well as the overall quality and moldability of pneumatically reclaimed sand is comparable or *superior* to new sand. It is actually more flowable and requires *less* clay for all-purpose molding than does new sand. Remember, too, that National pneumatic equipment gives you *control* over the physical characteristics of your sand.

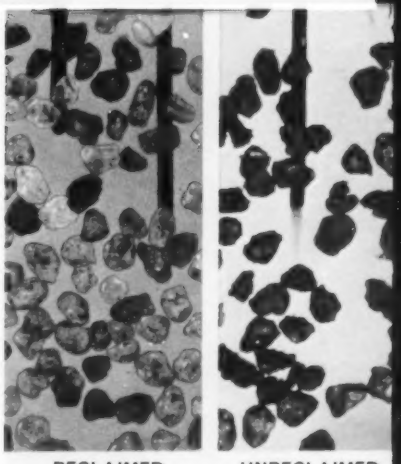
HOW EVEN-FLO WORKS

The National unit is comprised of a variable number of scrubbing cells (see cut). A turbine type blower supplies compressed air to nozzle (1) which accelerates air and sand upward through a blast tube (2) to the proper "scrubbing" velocity for type of sand to be reclaimed. Sand is impacted against sand already entrapped within a special conical target (3). The highly efficient scrubbing action of moving grains against stationary grains effectively cracks off carbonaceous matter, scrubs off spent clay and separates fused grains and agglomerates. Spent material and fines are carried off in the air stream (4). The treated sand is repeatedly recirculated (5) and an average cross section of the sand is continuously diverted to next cell via deflector plate (6) — where process is repeated.

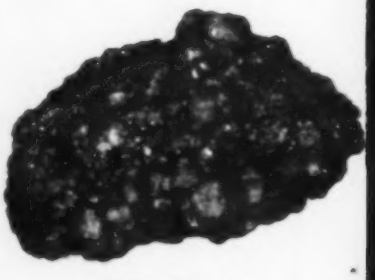
WHAT SANDS HAVE BEEN RECLAIMED?

Since first put in service in 1951, National Scrubbers have been used to reclaim practically every type of sand used in the foundry:

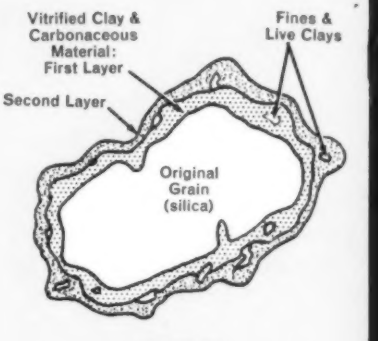
Type of waste sand:	Reclaimed for use as:
1. Waste, gen. steel shakeout	Facing and oil-bonded cores.
2. Grey iron core knockout	Oil-bonded core and all-purpose molding.
3. Grey iron shell shakeout	Resin-bonded shell molds and cores.
4. Malleable shakeout	Urea-bonded cores and special facing.
5. Brass foundry shakeout	Urea-bonded cores.
6. Grey iron foundry CO_2 mold shakeout	CO_2 molds and cores.
7. Grey iron foundry shakeout	Oil-bonded cores.
8. Grey iron core knockout	Oil-bonded dry sand molds and cores.
9. Steel foundry Olivine shakeout	Oliving facing and all-purpose molding.



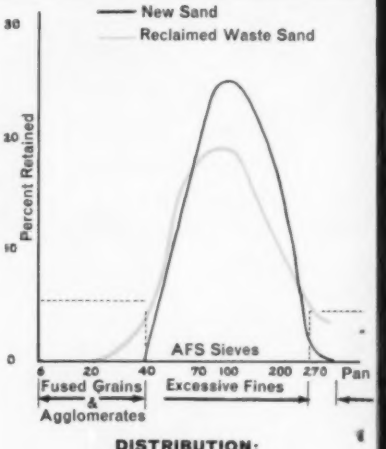
RECLAIMED UNRECLAIMED



"PICKLE" GRAIN
(Microphoto)



"SPENT" UNRECLAIMED SAND GRAIN

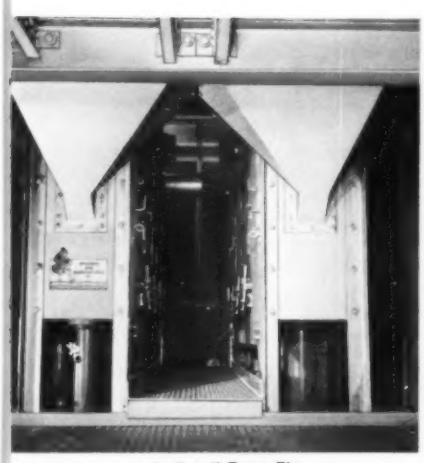


DISTRIBUTION: NEW SAND VS. RECLAIMED SAND

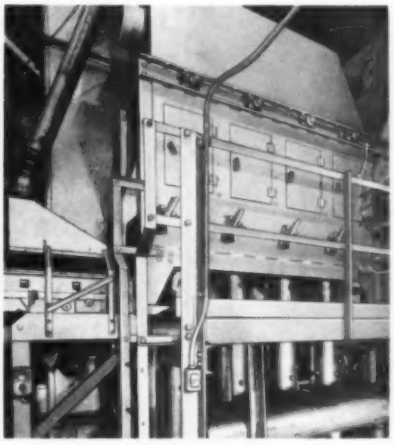
HERE'S HOW USERS SAVE WITH IT

*FOUNDRY	A	B	C	D	E	F
Power	$0.26	$0.17	$0.25	$0.43	$0.24	$0.27
Maintenance	0.10	0.05	0.10	0.30	0.10	0.22
Supervision & Dust Removal	0.13	0.30	0.20	0.40	0.33	0.20
NET OPERATING COST	**$0.49/T**	**$0.52/T**	**$0.55/T**	**$1.13/T**	**$0.67/T**	**$0.69/T**
New Sand Cost	$5.50	$10.09	$7.25	$7.50	$7.00	$5.79
Reclamation Cost	0.49	0.52	0.55	1.13	0.67	0.69
SAVINGS ON SAND	**$5.01/T**	**$9.57/T**	**$6.70/T**	**$6.37/T**	**$6.33/T**	**$5.10/T**
Sand processed per month	600 T	1000 T	600 T	1000 T	720 T	600 T
SAVINGS PER MONTH	**$3006**	**$9570**	**$3415**	**$6370**	**$4560**	**$3060**
Installed Cost	$34,800	$32,085	$41,945	$50,000	$36,355	$21,000
SAVINGS PER YEAR	**$36,072**	**$114,840**	**$40,980**	**$76,440**	**$54,720**	**$36,720**

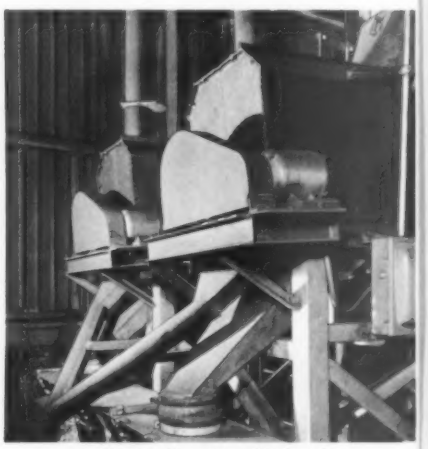
** Names Upon Request*



1. 8-cell Even-Flo. View down walkway.



2. 4-Cell Even-Flo, showing access platform.



3. Rotary Screens, discharge end of 8-cell Even-Flo unit.

HERE'S WHAT USERS SAY ABOUT THE NATIONAL SCRUBBER

SUPERIOR FOUNDRY, INC., Cleveland, Ohio

"Having pioneered this equipment in our foundry, we would be happy to recommend it to any foundry operator who is interested in improving quality and reducing sand costs. We appreciate the excellent attention your field men have given us through regular inspection visits and numerous suggestions relative to still greater efficiency."

DUNCAN FOUNDRY AND MACHINE WORKS, INC., Alton, Illinois

"We started operating the National Engineering sand reclaimer in March of 1952 and immediately decreased the consumption of new washed and dried sand from approximately 1.0 ton of sand per ton of good castings to 0.35 ton per ton of good cast. This included all sand used, both in the core room and in the foundry."

TEXAS STEEL COMPANY, Fort Worth

"Facing sand has better green properties and the flowability of the facing has increased tremendously. Our molders actually prefer scrubbed sand facing over new white facing. Our installation is being operated without any personnel except an occasional look by sand technician. We save the cost of dump truck, driver, and eliminate the problem of space in which to dispose of old sand."

CLARK EQUIPMENT COMPANY, Buchanan, Michigan

"The unit does not require special operator, aside from starting and occasional supervision during the day. We are still using the first set of blast tubes. Practically no maintenance is required."

HANFORD FOUNDRY COMPANY, San Bernardino, California

"We no longer need a large storage area for new sand and use this space for production purposes . . . savings per month indicate that the complete installation was paid off in twelve months."

FORT PITT STEEL CASTINGS, McKeesport, Pennsylvania

"We have discontinued the purchase of new sand for facing at a saving of over $3,000 per month. New sand is being used in core room only . . . hope to have the installation paid for in less than a year."

MINNEAPOLIS ELECTRIC STEEL CASTINGS CO., Minneapolis, Minn.

"The savings are simply amazing . . . saving of over 100 tons on sand consumption per week. This tonnage multiplied by $4.80 per ton, average cost of our sand, gives you part of the reason for our enthusiasm. Our only regret at this time is that we did not order the unit when you first put it on the market."

THESE ARE THE SIGNIFICANT FEATURES OF THE >>EVEN-FLO SCRUBBER

The new Even-Flo scrubber reflects *improvements* on a basic design. The proven operating principle has *not* been changed. Modifications were effected to provide the user with these additional benefits:

More efficient air flow. Redesign of piping has sharply reduced resistances. You get less pressure loss and more *work* for every pound of pressure expended in Even-Flo unit.

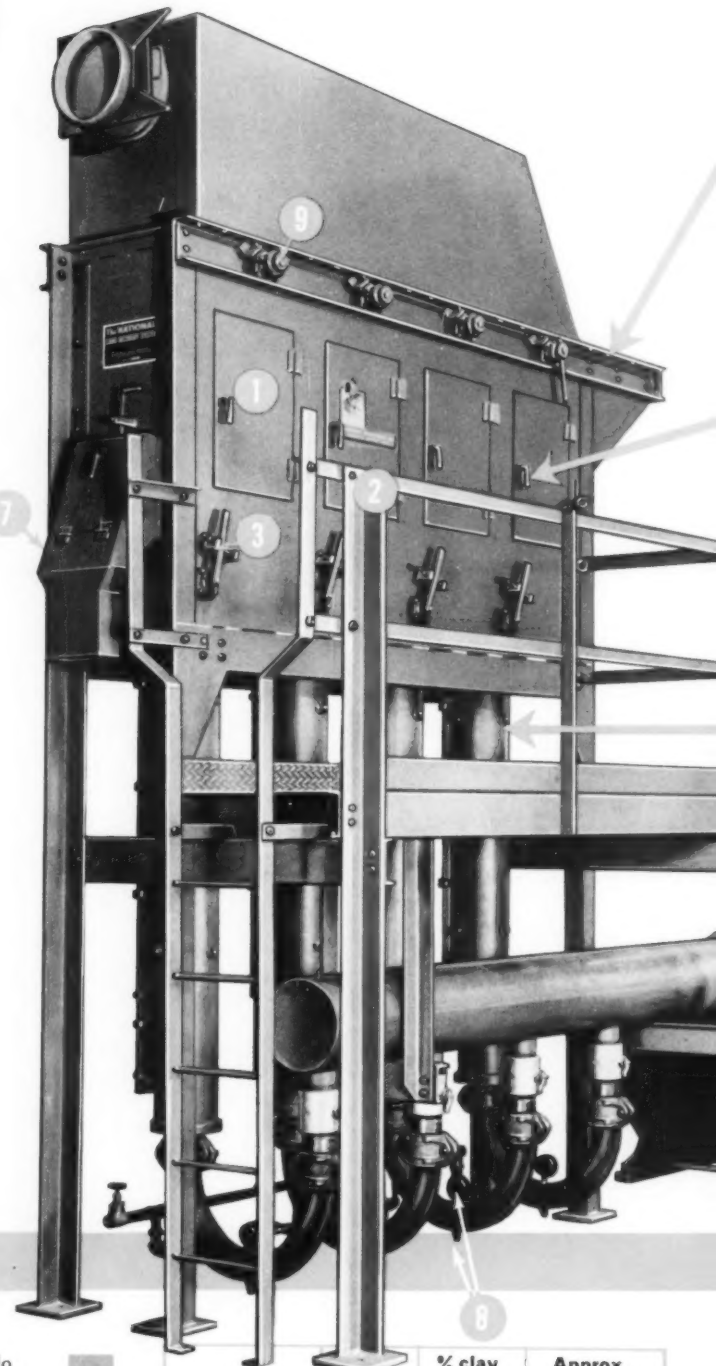
More compact installation. Even-Flo design requires much less headroom than the earlier, "step" type Scrubber unit.

Greater uniformity of product. New Even-Flo design with special deflector plates insures equal scrubbing action for *all* grain sizes.

More scrubbing control, Even-Flo unit is more versatile. You can scrub a more complete range of sand types and at same time take advantage of low operating and maintenance costs. Certain of these features are outlined at right.

SERVICE

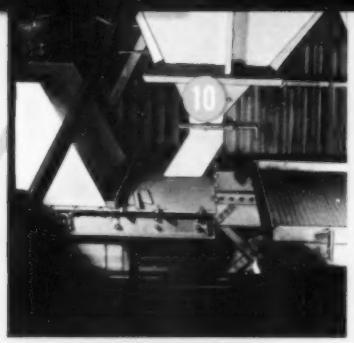
National's prompt service; knowledgeable engineering and careful erection practice form the basis for *any* efficient scrubber installation. A check with National customers will confirm our attentiveness and continuing interest toward our equipment in the field.

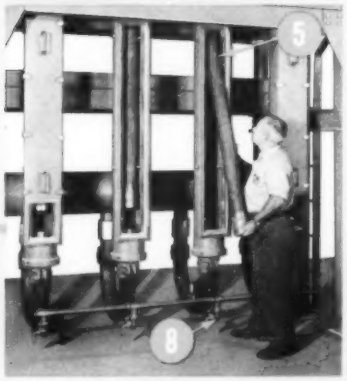


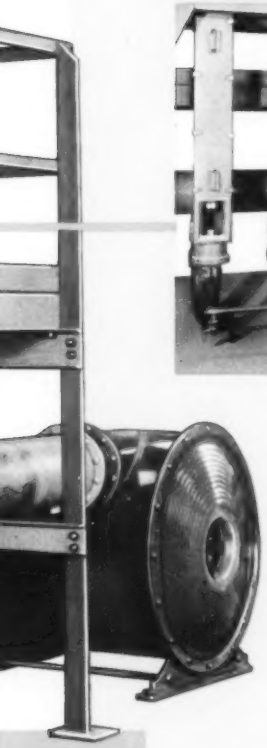
CAPACITY: The physical capacity of the Even-Flo unit is determined by the *usage* for the reclaimed sand. Hourly production is in direct proportion to the number of scrubbing cycles and/or scrubbing cells required. An outline of *approximate* capacities for various usage is shown here. Most important is the fact that *all* National Even-Flo Reclaimers are sold upon the basis of a performance *guarantee* based entirely upon *your* needs. Contact your local National agent or write for details on a test of the reclamation characteristics of *your* sand. There is no obligation.

Waste Sand	Use for	% clay permissible in recl. sand	Approx. input per hr. per cell*
Steel Shakeout	Facing	2.5—4	1500—3500 lb.
	Oil Core	.5—.7	500—800 lb.
Grey Iron Shakeout	Facing or	2—3	1000—2500 lb.
	Oil Core	.5—.7	400—700 lb.
Grey Iron Core Knockout Core		.5—.7	500—2000 lb.

*Are approximate because degree of contamination of waste sand is an important variable factor.







POSITIVE CONTROL

No-surge inlet gate (10) permits direct connection from storage bin or chute. Deflector plates (3) for each cell are adjustable from outside of housing—help control rate of flow and insure uniform cleaning of all size grains. Outlet gate (7) is only adjustment needed for day to day regulation of flow.

ACCESSIBILITY

Inspection ports (1) provide access even while unit is operating. Safety walkways (2) and ladders promote safety and quick access to interior components.

NO-WEAR TARGET (4)

Sand entrapment on underside of target virtually eliminates wear. Of 60 National units in field, only 72 extra targets over an 8 year period have been sold — most were spare parts and are still on reserve on the user's shelf.

LONG-LIFE BLAST TUBES (5)

Are centrifugally cast. Provide 7 to 10 times the life of standard steel tubes. Designed specifically to require inspection only at annual shutdown period, for most applications.

BOOSTER NOZZLES (6)

. . . one for each cell cancels *any* inertial effect due to pipe bends. Delivers necessary "kick" to accelerate sand to proper scrubbing velocity. Spacing between tube and nozzle is adjustable from outside of unit by calibrated ratchet (9).

PRESSURE CONTROL

Gauge and valve (8) for *each* cell is furnished. Assures optimum scrubbing action for pressure used. Can be set to permit greatest pressure in first cells where sand is "dirtiest," less in outlet cells . . . to minimize fracturing of cleaner grains.

INSTRUMENTATION

Unit is equipped with ammeter with transformers and a full set of positive pressure and fluidless negative pressure gauges. Separate stop-start push button stations for blower motors. Motor is *totally* enclosed. Two-step starter for higher HP motors.

FINES CONTROL

Chute is adjustable, louvered cascading type. Equipped with inspection door and negative pressure gauge.

DISCHARGE SCREEN (not shown)

A gold mine for metallic scrap. In addition, removes refractories, wood, paper, outsize grains, etc. Provides highest quality, cleanest, most workable reclaimed sand you can get.

The National Even-Flow Performance Guarantee

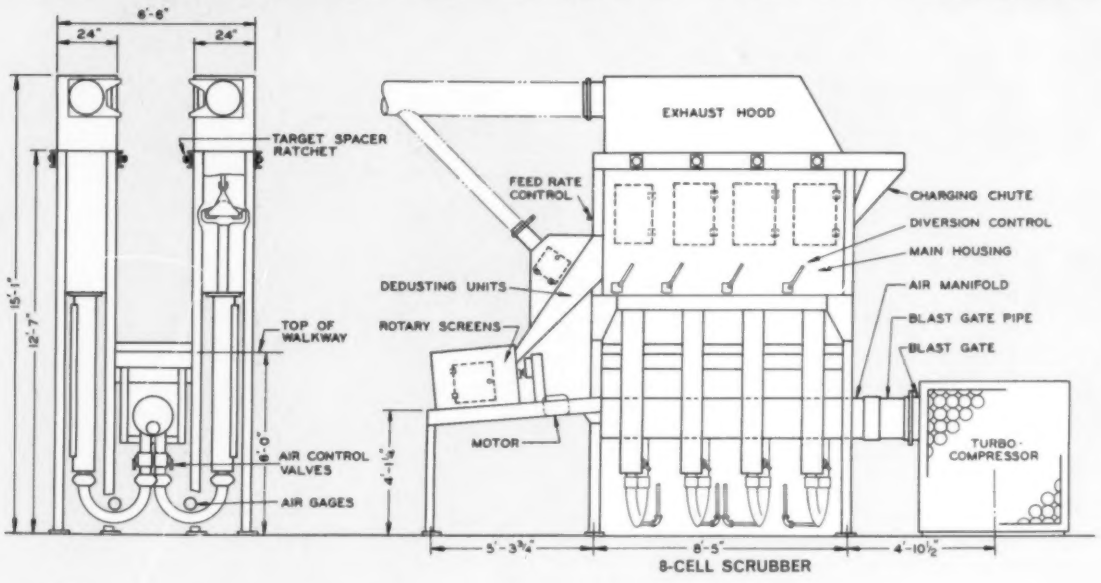
In order to insure a common understanding of the job requirement and to put our knowledge and experience to the most effective use, we issue a guarantee as to quality of sand and productivity of the National Scrubber.

It works like this:

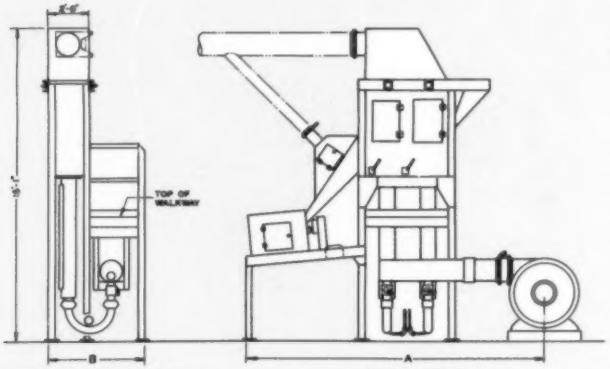
National processes samples of *your* sand in our pilot unit. *You* process molds with the test samples and select the quality of reclaimed sand you want from the Scrubber. We specify the unit for capacity. Then we build it, install it, test and adjust it to produce sand, at the desired rate, commensurate with the sand you have selected. *We work with you* until the unit fulfills these requirements.

We will not make unsubstantiated capacity or performance claims.

SPECIFICATIONS ON THE NATIONAL EVEN FLO SCRUBBER

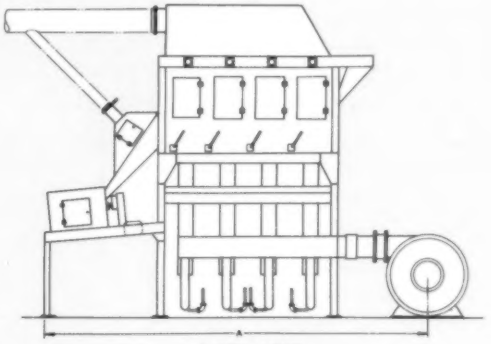


8-CELL SCRUBBER

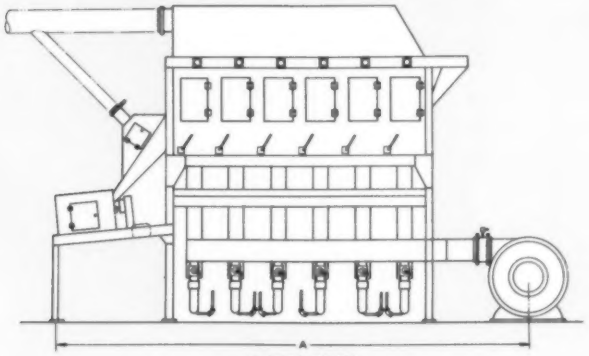


2, 4 and 6-CELL UNIT

2-CELL UNIT



4-CELL UNIT



6-CELL UNIT

SPECIFICATIONS—DIMENSIONS

	8-cell	6-cell	4-cell	2-cell
Exhaust CFM*	3000 (each side)	4200	3000	1800
Motor (HP)	75	60	40	25
Compressor (CFM at 48 oz.)	3750	2800	1800	1150
Dimensions: A	20'3½"	24'6"	20'6⅜"	16'4"
B	6'6"	4'4"	4'4"	4'4"

*Includes 600 CFM for each fines control unit.

SPECIAL UNITS: A compact economical and highly efficient *single cell* scrubber is available. May be used for pilot testing or for small foundry reclaiming jobs. *An extended cell scrubber* can be furnished where head-room permits. An extended last cell promotes optimum scrubbing and serves same purpose as bucket elevator, at lower operating costs.

WRITE FOR DETAILS

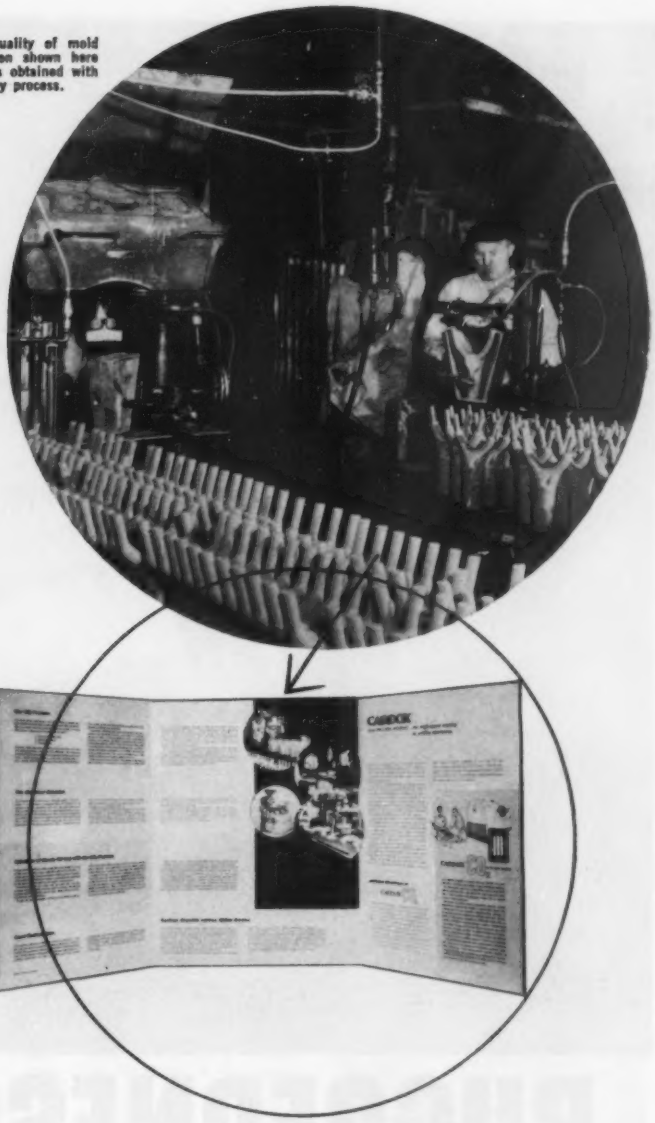
NATIONAL ENGINEERING COMPANY

549 West Washington Street Chicago 6, Illinois

In Canada: 17 Queen Street East, Toronto 1

Printed in U.S.A. • 3/60

The speed and quality of mold and core production shown here typifies the results obtained with Cardox CO_2 foundry process.



Want volume casting production with speed and dimensional accuracy?

What are the critical elements which must be controlled for maximum efficiency with the CO_2 foundry process?

What kind of sand should be used with the CO_2 process?

What makes the CO_2 process work?

These are just some of the many questions answered for you in this important Cardox booklet.

Foundrymen agree, the CO_2 core and mold hardening process is an established part of your industry. This booklet helps show why — and also shows how the Cardox semi-precision molding process can combine new productive efficiency with economy for you.

As an important improvement over conventional CO_2 foundry techniques, the process is enabling a growing number of foundries to save money while producing more castings — with smoother finishes and to closer tolerances — than ever before. Machining time is minimized, set-up time is reduced. And this is accomplished with little or no additional equipment expense, no major change in existing production methods.

Send for your copy of this authoritative Cardox booklet — another example of the complete Cardox Technical Service available to you. Simply fill in the coupon and mail it to Cardox. It could be the first step towards bringing true operating efficiency to *your* foundry.

To Get the Full Benefit From Your CO_2 Process . . .

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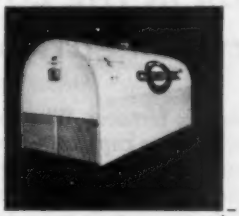
in any form, in any quantity

Bulk liquid carbon dioxide — ready for use at your plant — in a Cardox Storage Unit. Cardox provides tank installation, maintenance and up-keep. You pay for nothing except the CO_2 you use under the terms of your "keep full" user contract. Cardox' fleet of trucks and rail tank cars operating from over 60 plants and depots assure reliable CO_2 supply. Cardox CO_2 cylinder gas, dry ice and converters also available.



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←Circle 607 on Page 55

Circle 608 on Page 55

RUGGEDNESS...

A MAJOR FACTOR IN THE LOW MAINTENANCE AND HIGH AVAILABILITY OF LECTROMELT FURNACES

When you're selecting an electric furnace, compare design details and you'll note the heavier, sturdier construction that Lectromelt provides. This pays off for you in *service*—Lectromelt furnaces enjoy a world-wide reputation for high availability and low maintenance.

Lectromelt is the world's most experienced builder of electric furnaces. Whether your needs are for 200-pound or 200-ton capacities, it will pay you to get Lectromelt's recommendations when planning additions or replacements. Catalog 10 contains full information.

Lectromelt Furnace Division, McGraw-Edison Company, 314 32nd Street, Pittsburgh 30, Pennsylvania.

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Circle 609 on Page 55

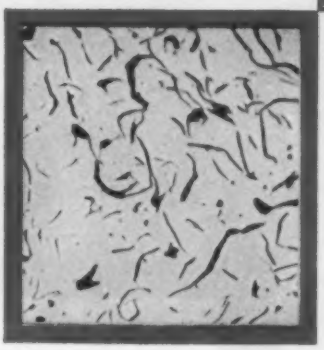
No.8® GRAPHITIZER

TREATS GREY IRON EFFECTIVELY FOR LESS THAN 10¢ PER TON!

Thousands of foundries are already employing No. 8 because it is such an amazingly simple and accurate graphitizer. No. 8 is a powerful inoculant. It plants graphite *throughout* the molten metal. No. 8 gives castings a higher machinability rating. It reduces chill and hardness in thin sections and improves wear and shock resistance. No. 8 makes castings more metallurgically uniform and, most important of all, No. 8 graphitizer *substantially reduces the cost of metal control* (cost figures in several foundries are below 10¢ per ton of metal treated). No. 8 is easy to apply by funnel or envelope method. As the photomicrographs shown here indicate, No. 8 is effective for special metallurgical control. From every standpoint it will pay you to use No. 8, regularly. For further details write for Engineering Bulletin No. 2.

Base Iron

Photomicrograph from broken half of 1.25 arbitration bar of gray iron not treated with No. 8 Cupola charge was made up of 48% steel, 33% cast scrap, 19% malleable pig iron and 45 lbs. of silicon briquettes. Total charge was 2544 lbs. This iron tested to the following physical properties: Transverse Strength 2,497 lbs. (wedge bar) • Brinell Hardness 229 (wedge bar) • Total Chill Depth 41/32 in., Clear Chill 26/32 in. • Deflection 0.23 in.



Note how the iron treated with No. 8 has increased in deflection. Usually iron treated with No. 8 will show an increase from 10% to 30% in deflection over the base iron value—this means less cracked castings and more serviceable metal.

Treated Iron

Photomicrograph from broken half of arbitration bar of same base iron treated with 1 lb. per ton of No. 8. Holding time in ladle following addition of Graphite was less than 8 minutes. Note how the addition of No. 8 has destroyed the dendritic pattern and has given a normal flake pattern. The treated iron tested to the following physical properties: Transverse Strength 2,970 lbs. (wedge bar) • Brinell Hardness 217 (wedge bar) • Total Chill Depth 13/32 in., Clear Chill 10/32 in. • Deflection 0.31 in.

GF240-1

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDER METALLURGY • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

Circle 610 on Page 55

How Lloyd Price increased

Removing the flash from some castings is no job for ordinary grinding wheels. Often the material is so sharp and hard that it gouges the surface of the average wheel like a wolf chewing chicken bones. At the Albert Lea Foundry, Albert Lea, Minnesota, the longest-lasting wheels they had ever been able to find for this purpose had had a useful life of two months.

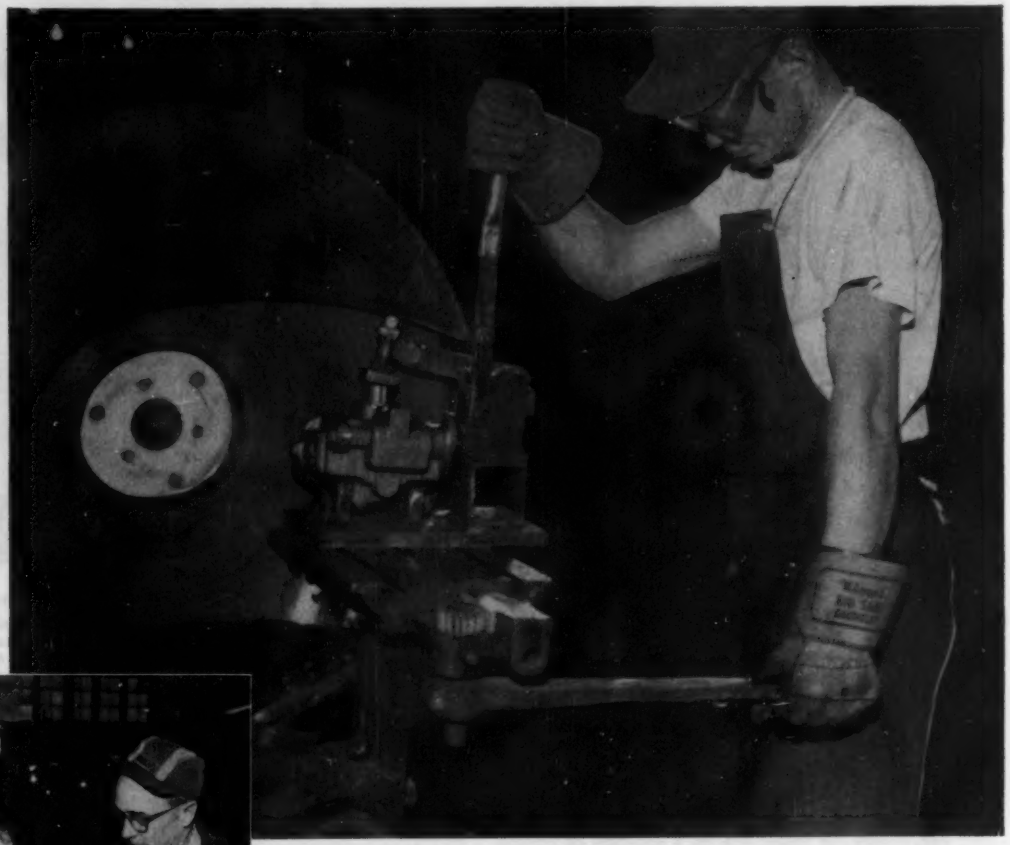
But the Albert Lea Foundry is the biggest independent outfit of its kind in Minnesota and they frequently have long-run jobs that add up to big tonnage. So they didn't give up the search.

Lloyd Price, Bay State Abrasive Specialist, was called in and he figured he could probably better the two-month life of his closest competitor. But even Price never forecasted the results he got.

Working with Bay State engineers in Westboro, he came up with a 30" resinoid bond wheel that finished no less than 207,176 individual castings over a ten-month period. The castings weighed a total of 1,771,355 lbs. This record performance was actually *five times better* than that of any previous wheel.

While this was a special case, it's surprising how often Bay State distributors and Abrasive Specialists are able to improve grinding wheel performance and cut costs even in apparently routine grinding operations. Why not see what your own Bay State distributor or direct representative can do to help *you?*

Better Grinding at lower cost . . . that is his business.



Operator Donald Wente grinds flash off casting with 30" Bay State resinoid bond wheel that finished more than two hundred thousand similar castings in a record-breaking useful life of ten months.

Cleaning Room Foreman Martin Bridley and Maintenance Foreman Clarence Bailey examine ground surfaces of intricate casting designed for major home appliance.

grinding wheel life 500% at Albert Lea Foundry

With a B.A. degree in Commerce, Bay State's Lloyd M. Price knows that a dollar cut out of costs is usually an extra dollar of pure profit. If he didn't learn it in college, he has certainly learned it from his years of practical experience, first, with Morse Twist Drill & Machine Co., and, now, with Bay State. As he says: "Cutting costs is just about the most important part of our business."

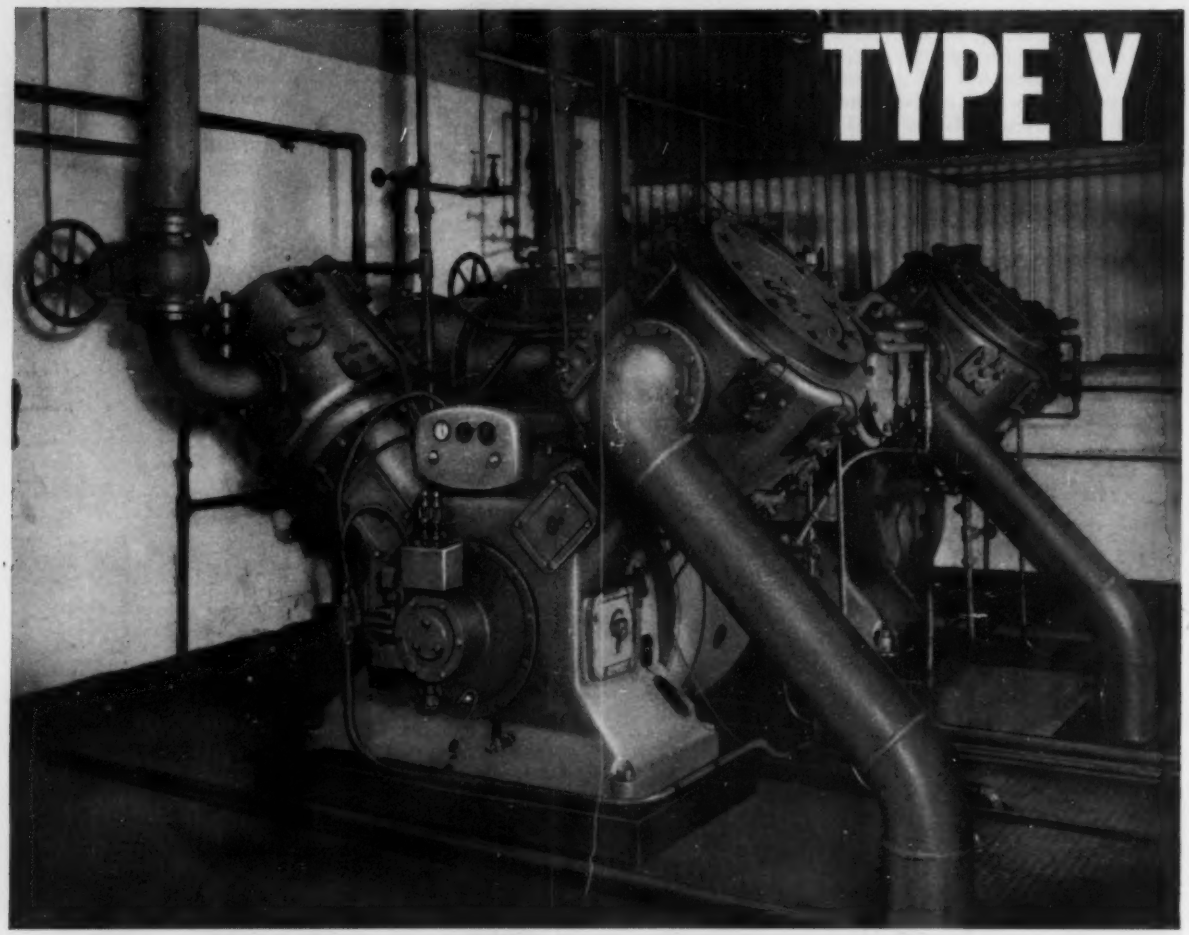
BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles. *Distributors:* All principal cities.

Circle 611 on Page 55

PACKAGE COMPRESSORS SIMPLE • COMPACT EASY-TO-INSTALL



Suitable for a wide range of requirements, these well balanced, smooth-operating heavy-duty compressors are available in:

- Single and multi-stage designs
- 400 to 1400 c.f.m. at 100-125 psi, 75 to 250 hp
- Choice of flange-mounted motor, coupled or belt drives

Other CP compressor types available from 7½ to 5,000 hp and pressures up to 15,000 psig . . . all built to provide "around-the-clock" service with minimum attention.

Chicago Pneumatic 8 East 44th Street, New York 17, N. Y.

AIR AND GAS COMPRESSORS • VACUUM PUMPS • PNEUMATIC TOOLS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS

PROOF: B&W Refractories withstand CO and H_2 prepared atmospheres

ATMOSPHERE	APPLICATION	CONSTRUCTION	RESULTS
60% CO	Pusher Type Malleabilizing Furnace	Walls lined with B&W K-23 Insulating Firebrick backed with B&W K-20 IFB. Roof construction—9′-0″ wide sprung arch of B&W K-23 IFB.	No major rebuilding in 21 years.
40% CO	Radiant Tube Annealing Furnaces Malleable Iron Company	Bases lined with 7″ Kaocrete-A, backed with 6″ Kaolite-20. Base size—21′-9¾″ x 9′-9¼″. Temperature 1550 to 1600 F.	In service 11 years. Reducing atmosphere has no effect on the base. All portable annealing furnace bases in plant lined with B&W castables. *Maintenance costs reduced greatly.*
		Bell type covers lined with 9″ B&W K-23 IFB standard shapes in the arch, side and end walls. 13½″ K-23, with Kaowool, is used around the radiant tube openings. Cover is 22′-6″ x 10′-5½″ outside x 8′-4½″ to top of arch.	After approximately 6 years of service, lining showed no disintegration from reducing atmosphere.
65% CO	Radiant Tube Annealing Furnace	Base lined with 5½″ Kaocrete-A and 3½″ Kaolite-20 on top of 5½″ of block insulation. Base size 21′-9″ x 9′-9″. Temperature 1700 F.	Formerly heavy firebrick linings required rebuilding yearly. B&W castable construction has given more than 9 years' service. Customer standardized on B&W castables.
100% N_2 and 100% H_2	Elevator Type Annealing Furnaces Large Steel Co.	Walls lined with 9″ B&W K-23 IFB plus 3″ K-20 IFB. Furnace size 6′-0″ x 16′-0″ x 4′-0″. Temperatures in excess of 2100 F.	B&W refractories show no sign of deterioration in six furnaces of this type in 3 years' operation. Barring mechanical damage, refractories should give long additional service.
100% H_2	Rectangular Hood Type Annealing Furnaces	60 Furnaces, 24 have wall construction consisting of 18″ B&W K-26 IFB plus 2½″ K-1620 IFB. 36 units use wall of 9″ B&W K-26 IFB plus 5″ K-1620 IFB. Furnace size—12′-0″ x 8′-6″. Temperature 2150 F.	Of the 60 covers in service only 2 were rebuilt after 2 years' service. Plant masonry superintendent reports no shrinkage; estimates 15 years' additional life if not for mechanical abuse.

B&W

THE BABCOCK & WILCOX COMPANY

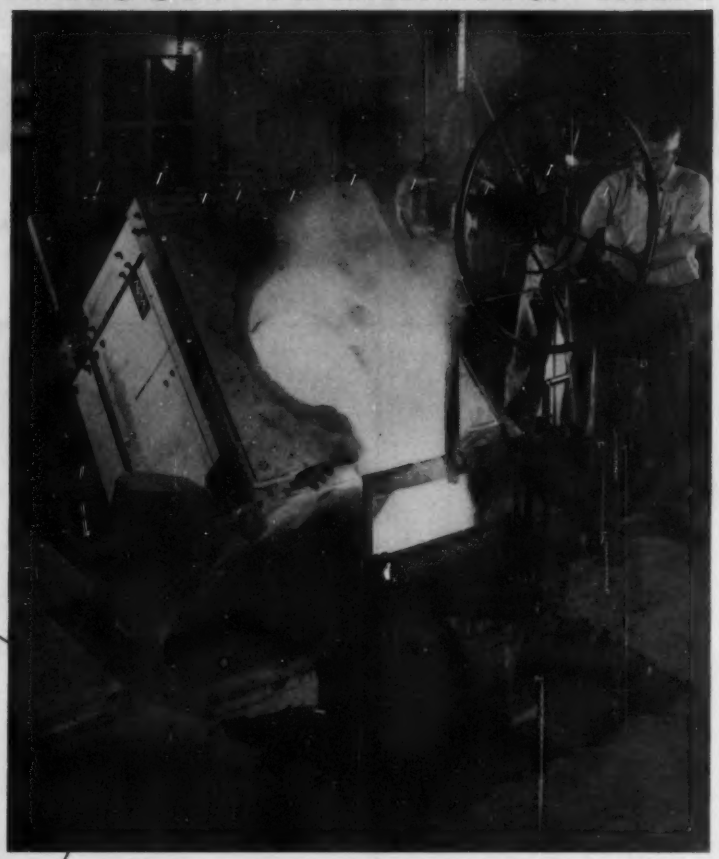
REFRACTORIES DIVISION

B&W Firebrick, Insulating Firebrick, and Refractory Castables, Plastics, Ramming Mixes, Mortars, and Ceramic Fiber.

Circle 613 on Page 53

WITH TAYLOR ZIRCON RAMMING MIX

Mould Manufacturer cuts induction furnace lining costs by 50%



Pouring a heat of grey iron from 650 lb. high frequency induction furnace lined with TAYLOR ZIRCON No. 717 Ramming Mix.

TAYLOR ZIRCON No. 717 Ramming Mix has cut refractory lining costs *in half* for a mid-west mould manufacturer. In addition, average number of heats has increased. This company melts grey iron in 650 lb. and 1000 lb. induction furnaces to produce moulds for the glass industry.

Alert foundries are standardizing on TAYLOR ZIRCON Ramming Mix as the most economical lining for high frequency furnaces. High softening point, low thermal conductivity, high di-electric strength, and volume stability make TAYLOR ZIRCON an excellent refractory for this service. For detailed information, write direct, or call in a Taylor field engineer.

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
Oakville, Ont., and Montreal

The **CHAS. TAYLOR SONS Co.**
A SUBSIDIARY OF NATIONAL LEAD COMPANY
REFRACTORIES SINCE 1864 • CINCINNATI • OHIO • U. S. A.

Circle 614 on Page 55

new look
(and greater efficiency)
in Magnetic Particle Flaw Detection Equipment

6000 Ampere *Stationary Model*
PICKER FERROSCOPE
for Wet Technics

new outside

- *Clean-lined modern design: easy to clean, easy to keep clean.*
- *Modular principle: units combine to handle parts up to 12 feet long.*
- *Meters and signals function-grouped at eye level.*

new inside

- *New heavy duty silicon full-wave rectifiers run cooler, quieter.*
- *Heat capacity five times greater than MIL Type II specs call for.*
- *Does away with noisy, grime-blowing exhaust fans.*

3000 Ampere *Mobile Model*
PICKER FERROSCOPE
for Wet and Dry Technics

new outside

- *Roll-to-the-job unit: companion design and same finish as big Ferroscope.*
- *Easy to read meters, husky control knobs.*

new inside

- *Same heavy duty cool-running silicon rectifiers as 6000 A. unit.*
- *Heat capacity fivefold greater than required by MIL Type III specs.*
- *Either AC or half-wave DC always on tap for best results with both wet and dry technics.*
- *Stepless current control up to 3000 A.*
- *All operation controllable at machine or by*
- *remote handswitch on long cable.*

For heavy duty inspection schedules, one or the other of these Ferroscopes may be just right for you. Or maybe a smaller Ferroflux or Portaflux portable magnetic particle inspection unit would be adequate to your lighter need. In any case, call in your local Picker representative: he will be glad to advise you about these, or any of the other nondestructive inspection systems Picker offers (they're listed below).

ONE STOP *for all this* | ***in non-destructive inspection equipment***

Picker x-ray

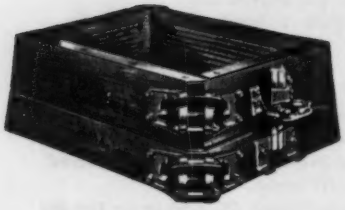
PICKER X-RAY CORPORATION
25 South Broadway, White Plains, N. Y.

x-radiography	**ANDREX** portable x-ray units-140 KV, 160 KV, 200 KV, 260 KV **PICKER** x-ray units—35 KV Beryllium window, 90 KV, 110KV, 150 KV (stationary and mobile), 270 KV portable
gamma radiography	**PICKER** *Pipeliner*—30 curies, Ir^{192}, *Cyclops*—1500 curies; Co^{60} **TECH/OPS** Iridium^{192} units from 10 to 100 curies; Cobalt^{60} 3 to 100 curies: also Thulium^{170}, Cesium^{137}
fluoroscopy	**PICKER** Image Intensifier and associated equipment
magnetic particle	**PICKER** *Ferroscope* *Ferroflux* *Portaflux* **PIXmag** Ferropowders and pastes
dye penetrant	**PIXchek** Penetrants, Cleaners, Developers, and accessories

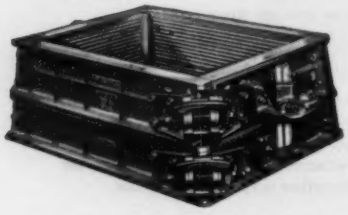
Circle 615 on Page 55

REDUCE YOUR COSTS

ADAMS Cast Iron or Cast Aluminum Jackets



CHERRY EASY-OFF FLASK



ALUMINUM EASY-OFF FLASK

Look at these features and you'll agree that the Adams line can mean economy, efficiency, and better molds for your foundry.

Above is the Adams jacket available in either cast iron or cast aluminum. They are cast from a top grade metal mixture best suited for their purpose. The sturdy construction as a result of the vertical ribs inside and horizontal ribs outside plus the handles at either end assure you of long life for this equipment and ease in handling. These jackets afford you MAXIMUM STRENGTH and MINIMUM WEIGHT.

Here are jackets that assure you perfect mold fit—will give you the greatest strength while under pouring strain—allow for free flow of gases all because of INSIDE CORRUGATIONS. These VENTILATED jackets are first choice in foundries across the nation.

Look into the advantages cast iron or cast aluminum can offer you depending upon your foundry needs. We will be happy to make recommendations to fill your requirements.

For the most complete line of flask equipment available . . . always look to Adams!

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

MASTER PLAN FOR MODERNIZATION

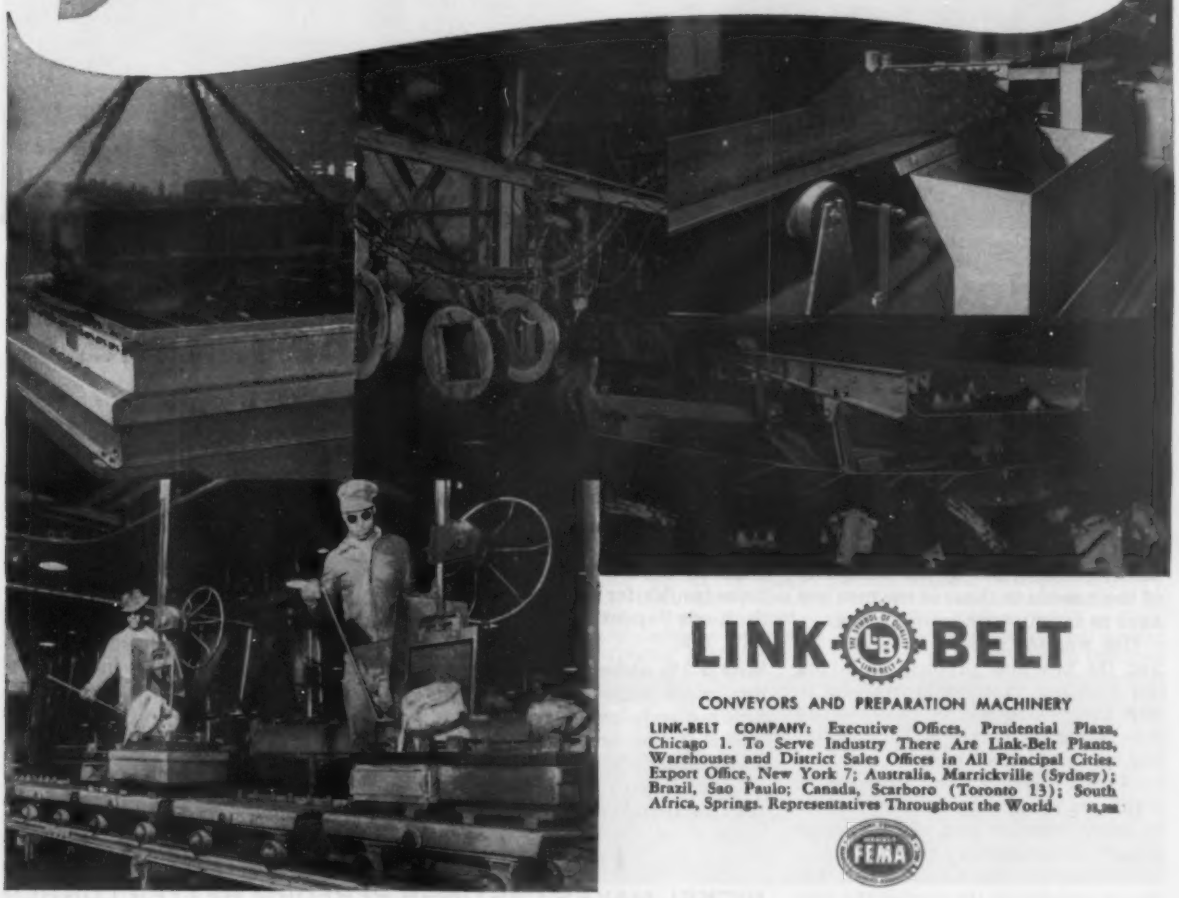
step-by-step mechanization

WITH LINK-BELT EQUIPMENT

MECHANIZATION is the surest way to greater foundry productivity . . . at lower cost. And if budget limitations won't allow a *completely* mechanized system immediately, then a Link-Belt step-by-step program is the answer. Start modernization where you need it most . . . then proceed according to a well-organized plan.

There are two reasons why Link-Belt is *best* qualified to help you plan and carry out a step-by-step improvement program —(1) 50 years' foundry experience. (2) industry's broadest line of conveyors and preparation equipment. Whether it's the handling of sand, cores, molds, castings . . . or a completely integrated system—Link-Belt will provide equipment that results in more efficient operation, lower costs, better working conditions.

Our staff of foundry specialists is available for counsel with you or your consultants. Call your nearest Link-Belt office or write for Book 2423. Ask, too, about our thirty-minute, color-sound film, "Foundry Flexibility." It will be lent on request for viewing by your group.



LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 35,288

FEMA

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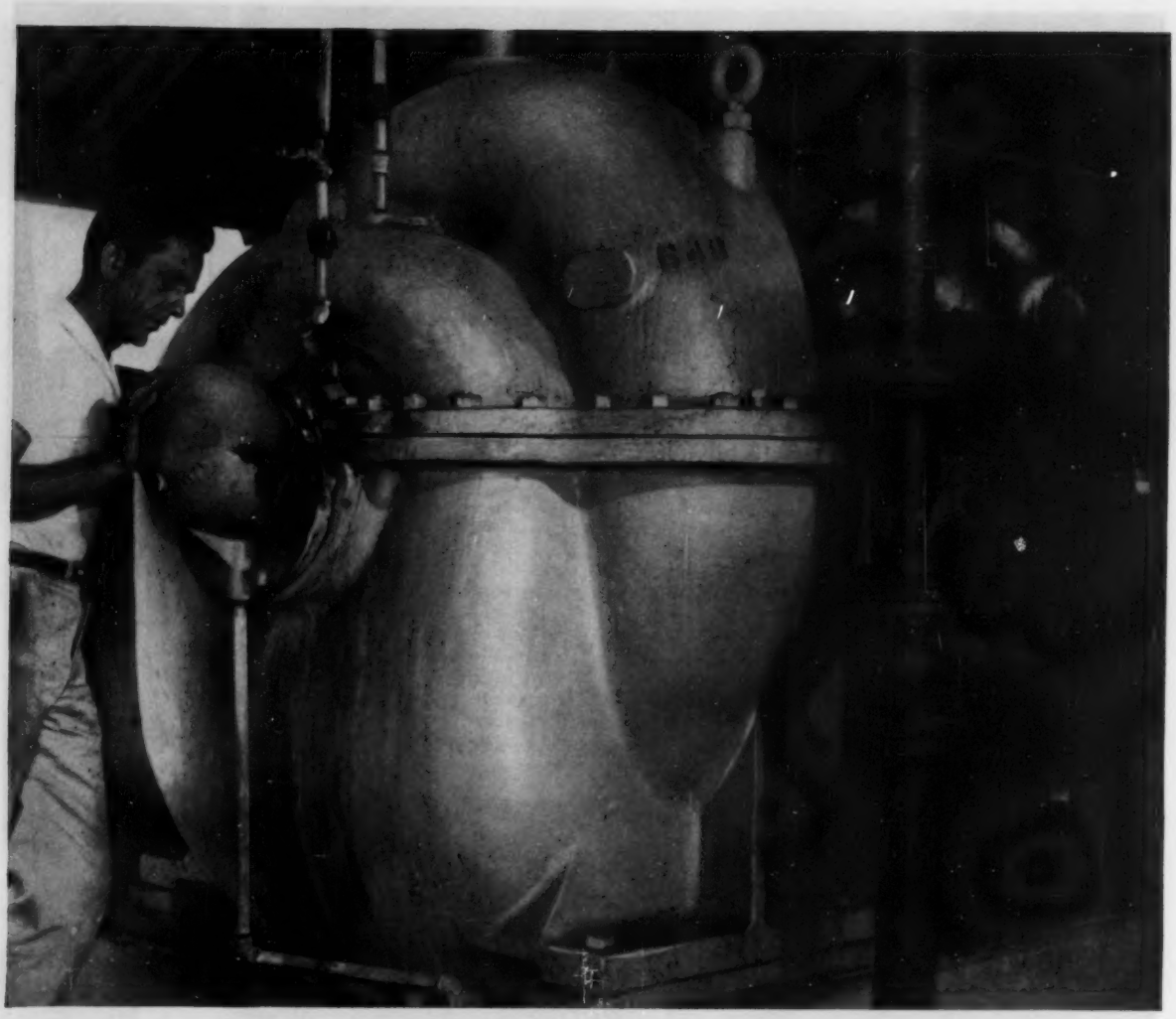

How a 2% nickel cast iron helped a foundry satisfy "the-man-in-the-middle"

The "man-in-the-middle" is really a composite; several officials of a typical Original Equipment Manufacturer, the C. H. Wheeler Manufacturing Co., makers of the pump shown above.

You know these men well; not by name, perhaps, but by the similarity of their needs to those of the men *you* have to satisfy with *your* castings.

One was *the pump's Designer*. He had the practical problem of laying out a casing that would conform to flow theory and still be castable. He was responsible, as well, for specifying an economical casting material that would provide adequate pressure tightness along with high resistance to wear, erosion and the corrosive attack of fast-moving seawater.

Wheeler's *Production Manager* was deeply concerned. He wanted the closest, as-cast, dimensional accuracy. Uniform metal structure and excellent machining properties, too.

The *General Manager* had still other considerations. What he was looking for was top production economy consistent with the high strength and stamina needed to insure freedom from trouble for Wheeler's customer, St. Regis Paper Company of Jacksonville, Fla.

With a 2% nickel cast iron, the foundry could satisfy easily all these diverse requirements. The use of Nickel in the composition gave them a high order of control over the irregular sections of the casting, providing uniformity of structure and soundness throughout.

With better control over such properties the foundry can, as in this instance, avoid many of the possible causes for reject.

If you produce cast iron, you will want to obtain an interesting summary of what the foundryman can offer Original Equipment Makers in nickel cast irons, and of how they can best be heat treated, machined, and welded. Send for our informative, 32-page booklet, "Engineering Properties and Applications of Nickel Cast Irons".

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N.Y.

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

Circle 618 on Page 55

NEWAYGO IS ON A PRODUCTION LINE BASIS TO MEET THE DEMAND FOR THE NEW EHS MODEL HANDY SANDY!

One whole section of Newaygo's manufacturing facilities, shown here, has been established for production line operations in assembling EHS MODEL HANDY SANDYS to meet the demand for this new unit, which was introduced in 1959.

One prominent West Michigan foundry recently purchased six of these EHS HANDY SANDYS in one order.

This EHS MODEL HANDY SANDY is another example of Newaygo's *leadership* in producing components for foundries — here is an expansion of the famous Handy Sandy for expansion of capacity. This "big brother of the HS Model" handles up to 20 tons of sand per hour.

The EHS MODEL HANDY SANDY has 8-inch by 5-inch cast buckets; 10-inch wide rubber-covered elevator belt; cast head and tail pulleys; heavy duty anti-friction bearings throughout; and cutting blade type of aerator with separate motor drive.

HANDY SANDY Distribution Lines With Up to 12 or More Overhead Sand Hoppers
Here is a 4-station distribution line, plus an overflow hopper at head-end of conveyor, and fed with a 20 T.P.H. capacity MODEL EHS HANDY SANDY Elevator — aerator combination with 7-foot lower feed hopper. Four plows on overhead belt are air-operated with fully automatic controls, by using Newaygo's new MULTI-LEVEL hopper probes. This automatic control recently developed by Newaygo allows fully automatic operation of the unit, without manual attendance.

These will help YOU:
Our 16mm, 33-minute movie, "Progressive Mechanization", showing Newaygo equipment featuring HANDY SANDYS in 9 foundries. . . . Our 16mm, 35-minute movie, "Newaygo Pallet Systems for Mold Handling", presenting many types of Pallet Line Installations in foundries. . . . Our semi-monthly magazine, "SAND SCRIPTS". . . . . Our Bulletins — No. 60 on Pallet Line Systems of Mold Handling; No. 59 on HANDY SANDYS: No. 56 on Newaygo Sand Handling, Mold Handling and Mold Making Equipment.

"Foundry Business is **BIG** BUSINESS . . ."

NEWAYGO engineering company
NEWAYGO, MICHIGAN
and profitable, too, with NEWAYGO MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT
Also Manufacturers and Installers of MULTI-LEVEL HOPPER CONTROL SYSTEMS, CAR CONVEYORS, APRON CONVEYORS, ROTARY FEEDERS and FOUNDRY AUTOMATION

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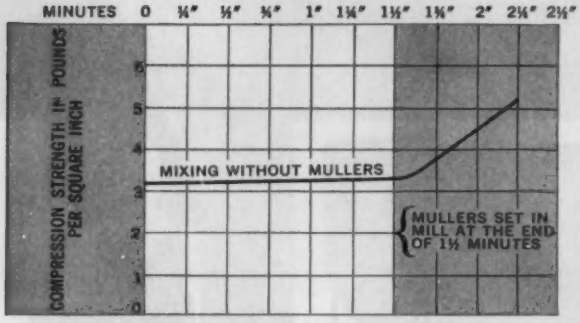
Muller Mixing Increases Sand Strength Greatly . . . Rapidly!

Sand Strength Curve Proves the Difference



This Strength Curve Chart demonstrates how much more effective muller mixing of sand is over regular scraper type mixing. In this test a Clearfield mixer was used to mix a charge of 91% burned sand, 3% bond and 6% water. At the start of the run the mulling wheels were removed completely . . . the batch was charged and the mixing operation continued for 1½ minutes with only the disc and agitator operating on the material. *There was only a slight increase in the strength of the sand.* Then the mullers were set into the machine and operation on the same batch continued for 1¼ minutes. During this very short period with the mullers operating, *the sand strength increased very rapidly.* You can speed production, with assured quality results—and cut costs too—with a Clearfield muller-type mixer. *Let us prove the superiority of Clearfield Muller-type Mixers with a sample run of your own batch. Just call us.*

WITH its speed, dependability and special mixing features, a Clearfield Mixer prepares your sand properly and exactly as you want it . . . thus paying for itself many times over. In addition to the strength-building mullers, Clearfield Mixers have other features that assure quality results every time. First, all Clearfield Mixers work on the rotating pan principle so that every particle in the batch is kept in continuous motion, with the ingredients alternately spread and gathered together to maintain highest mixing efficiency.

Another feature is the patented star-shaped agitator which covers the entire flat surface of the revolving bottom and prevents material from forming hard cakes or lumps. The agitator is driven automatically by the force of the sand being rotated by the pan motion; a "whirlpool" action is created, speeding up the mixing process and promoting clean emptying of the pan.

The Clearfield double-duty disc, also patented, cuts all the material free from the revolving pan rim at each revolution, turns it over and diverts a continuous roll of material under the mullers. (Moved to the discharge position, this disc unloads the complete batch in 15 to 20 seconds!)

You get thorough, proper blending and mixing when you use a Clearfield Mixer.

for complete details about the wide variety of Clearfield Mixers, write for Catalog No. 90

CLEARFIELD
MACHINE COMPANY
CLEARFIELD, PENNSYLVANIA, U.S.A.

From ten-yard pipe to ten thousand valves Hevi-Duty matches the furnace to your requirements

Whether you process 30-ft castings or thousands of small parts . . . whether you use fuel-fired or electric heat . . . automatic or batch handling, the correct combination can be supplied by Hevi-Duty.

Hevi-Duty offers a wide selection of furnaces, each one carefully engineered to hold close tolerances . . . to turn out uniformly high-quality products day after day, year after year.

If you have a heat-processing problem, why not call in a Hevi-Duty sales engineer? We are almost certain he can help you, for he is much more than an order taker. He is a consultant— qualified to recommend entire heat-processing systems and backed by a company that can quickly adapt the equipment to fit your needs exactly.

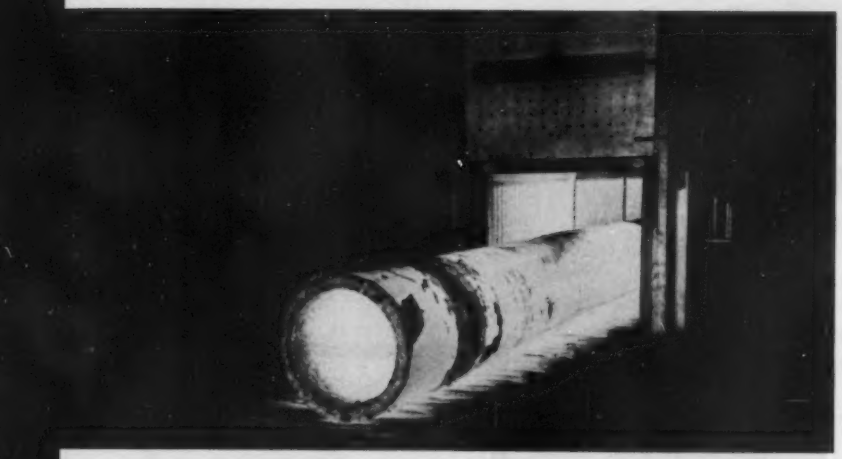
HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

B P C

A Division of Basic Products Corporation

Hevi-Duty Electric Company, Milwaukee 1, Wis.



◀ Sandusky Foundry and Machine Company, Sandusky, Ohio, uses this Hevi-Duty car-bottom furnace to heat-treat castings up to 54 inches in diameter and 30 feet in length. Heating elements located in both ends, and in the car bottom, plus three fans, produce a degree of temperature uniformity generally expected only in smaller units. **For complete information, write for Bulletin 644R.**

▲ Pacific Steel Casting Company, San Francisco, California, is pleased with the operation of this Hevi-Duty Clean-Line Furnace. It heats, holds at the correct temperature for the prescribed period, transfers each load to the cooling chamber, and discharges baskets of castings automatically. A retractor on the unload table enables the Clean-Line Furnace to process four baskets without manual handling or supervision. Heat-treated castings come out ready for shipping without further attention. **For complete information on this, write for Bulletin D-100A.**

▲ Eaton Manufacturing Company's Valve Division really proves the ability of Hevi-Duty pit furnaces to maintain uniformity. They process dense 2,000-lb charges of valves — 10,000 to a load — all free from distortion, all uniformly hard . . . no rejects. An efficient fan and baffle system provides an even rate of heating throughout the dense load and contributes to over-all uniformity. **For complete information, send for Bulletin 646A.**

Circle 621 on Page 55

Introducing

Ster-LINKED® POURING JACKETS

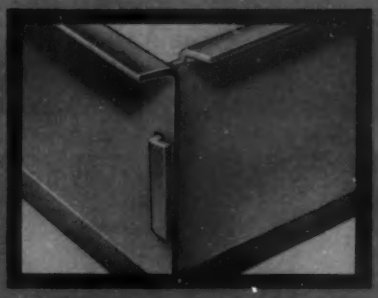
EASIER TO HANDLE

Patent Applied For

- Exclusive chain-link, locked-corner construction facilitates rapid assembly and disassembly
- Corners automatically adjust to any mold angle between 3° and 5°
- Entire steel jacket assembly locks at *one* corner with but *one* cotter
- Tapered, self-positioning lower flanges eliminate possibility of sand cut-ins
- Broad upper reinforcing flanges act as convenient lifting handles
- Knock-down construction minimizes shipping costs and conserves storage space
- Minimum assortment of side-and-end lengths can produce a variety of assembled jacket sizes
- Complete range of sides and ends, in various depths, available from stock

Circle 622 on Page 55

Three corners of every Ster-LINKED pouring jacket have quick-connect joints which operate on conveyor chain-link principle — rectangular mortises through which radiused tenons lock in all but one angular position. Thus each corner holds its side-and-end members securely during all handling, assembly, or disassembly operations — until it is deliberately unlocked by opening the joint to the position where the tenon can be withdrawn from the mortise.



With but one locking corner, Ster-LINKED pouring jackets are far easier to handle—maintain their assembled shape even when the locking corner is open. No members become disengaged during fitting or removal from the mold. No multiple locks are employed to make handling awkward. Lock is simple, yet positive. Single cotter holds straight tenon securely in locking-corner mortise — is easily replaced by any handy pin if misplaced or damaged.

AD-4841

Sterling WORLD WIDE SERVICE

STERLING NATIONAL INDUSTRIES, Inc.
Founded 1904 as Sterling Wheelbarrow Co.
Milwaukee 14, Wisconsin, U. S. A.

Associate: STERLING FOUNDRY SPECIALTIES LTD.
LONDON • BEDFORD • JARROW-on-TYNE, England

FOUNDRY
SEPTEMBER 1960

It's Your Gain

While most members of trade associations continue their support whether business is booming or suffering from economic weakness, some are inclined to drop association membership when the going gets a little rough. On the other hand, many foundries do not support their trade associations at any time.

Why do these companies display such indifference to one of the important tools of modern business in the fields of manufacturing, merchandising, or service?

Can it be that those who withhold support do not understand the functions of a trade association or its benefits to the individual member?

Does the nonmember reason like this: "I am getting along fine in this business without any knowledge of what my competitors are doing, other than what I can get from Dun & Bradstreet or my venders. I do not need statistics to compare my operation with others. I have no need for research, and I can't afford to advertise. Too much time is wasted at meetings, and my operation is good. My operating people do not have time to serve on committees, participate in research projects, or attend marketing conferences. We need them on the job daily to continue to be successful. The association may be a desirable thing, but we can't afford it either in time or money."

How shortsighted can you get? Surely the tremendous contributions of trade associations in the areas of statistical comparison, cost-finding techniques, merchandising, advertising and promotion, and research, to say nothing of the inestimable value of meeting and exchanging ideas with others in the industry, are plus values that no capable and responsible business executive can afford to disregard. These things, which have meant and are meaning so much to the various industries producing metal castings, simply would not have been done if the association had not provided the mechanism through which people can work together toward the common goal of progress.

Businessmen should look upon their trade association program as an adjunct to their own business—just as important as the various departments in the company's operations. It is a place to obtain the results of research and promotion that could not be carried on in any other way, and to obtain information about the industry which would not be made available to others except through an independent source.

And, never forget, your trade association becomes an indispensable tool in keeping your organization in business in times of national emergency.

We urge a continuation of membership in your trade association.

If you don't belong, grasp the opportunity to promote your own business. Join now.

Frank G. Steinebach
Publisher
Editorial Director

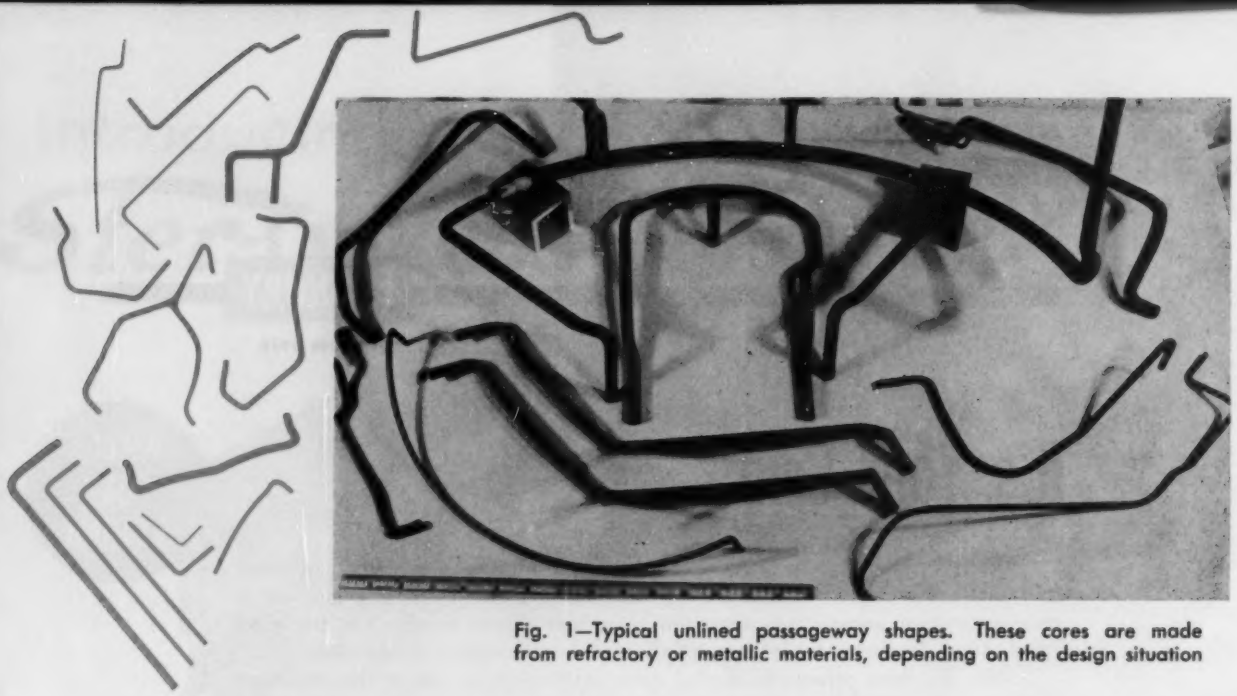


Fig. 1—Typical unlined passageway shapes. These cores are made from refractory or metallic materials, depending on the design situation

FORMING UNLINED PASSAGES

. . . In Light-Metal Castings

Advances in foundry technique have made it possible to incorporate complex unlined passages in light metal castings. This article describes the status of this practice

By H. E. ELLIOTT and J. G. HOUSE
Dow Metal Products Co.
Midland, Mich.

Fig. 3—Core assembly shows the passageway cores being put into place. These cores are for use in any of the common magnesium or aluminum-base casting alloys

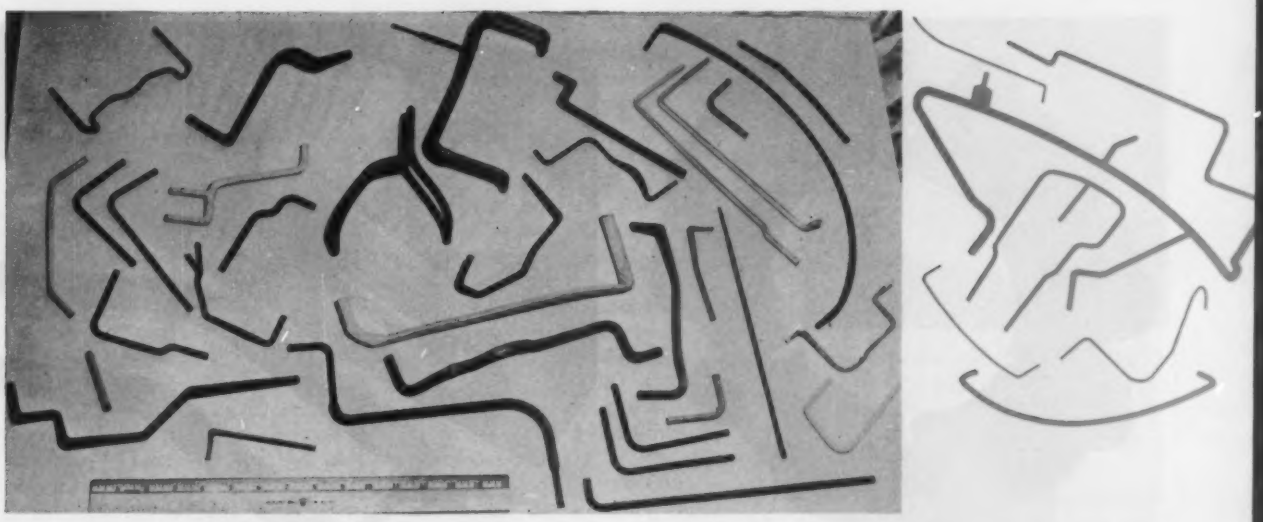


Fig. 2—More cores for unlined passages. Processes for core removal include chemical, mechanical, or combined chemical and mechanical

● IN ASSEMBLIES which embody light metal castings, a common problem involves the transfer of fluids from one place in the assembly to another. The fluids may be lubricants or heat transfer media, and often they are under pressure.

In the past, the conventional solution to this problem was the use of external "plumbing." With this approach to the problem, a basically simple design often lost its simplicity in a maze of tubing, and innumerable fittings were required. The high cost of fabrication was only the beginning of a series of problems that included loosening up of the connecting fittings under the influence of vibration in service.

A significant advance was the development of techniques by which stainless steel tubes could be cast into the light metal castings, creating internal passageways for the transfer of fluids. In many applications, this expedient continues to serve well as an improved solution to the problem.

Now, however, further advances in foundry techniques have made it possible to incorporate so-called "unlined passages" in light metal castings—passages that have the same geometry as those formed with cast-in tubing, but with the stainless steel lining eliminated.

This article is intended to describe the present status of this art and, particularly, to point out the comparative advantages of the older practice of casting in tubing and the newer art of producing unlined passages.

Lined vs Unlined Passages—In making a choice between cast-in tubing and unlined passages, the designer needs to consider the following factors:

1. *Pressure Tightness Requirements:* Good foundry practice and judicious choice of alloy make it possible to achieve pressure tightness of unlined passages even under rather severe conditions. But it is to be expected that where low-viscosity fluids must be retained under high pressure, stainless steel tubing will be more consistently pressure tight than a cast metal structure, without the need for the expense of impregnation and pressure testing.

2. *Weight Savings:* A casting with unlined passages will be somewhat lighter than its counterpart with cast-in tubing. It not only eliminates the stainless steel lining, but also avoids the need for "tap-in-blocks" to connect the passageway system to external plumbing. Additionally, it sometimes is necessary to thicken walls locally around the cast-in tubing to prevent misruns or coldshuts around the tube.

3. *Heat Transfer:* If the passage is designed to circulate a coolant through the casting wall, eliminating the stainless steel lining removes a barrier to heat transfer, making the cooling passage more efficient.

4. *Comparative Costs:* Whether the part is made with stainless steel tubing or with unlined passages, a "core" must be fabricated to form the passage. In one case the core is left in; in the other, it is removed. Generally, fabrication of the core to form the unlined passage is somewhat less costly than fabrication of a stainless steel tubing assembly. With unlined passages, however, additional costs are introduced by the problems associated with removal of the core material from the casting and inspection of the part to insure completeness of the removal of such core materials. Usually, over-all costs of the two methods do not differ greatly.

5. *Design Flexibility:* Although either method becomes increasingly costly as the passageway system becomes increasingly intricate, the unlined passageway techniques are more readily adapted to odd shapes and to progressively changing cross-sectional shapes and sizes from point to point along the passageway.

Processes—No one process is uniquely best in all design situations that arise in the production of castings with unlined passages. Many foundrymen have found that they can do things with sand cores in design ranges previously considered impractical if they are given the incentive of avoiding the costs of more involved processes. When the cross-sectional areas become too small or the unsupported length

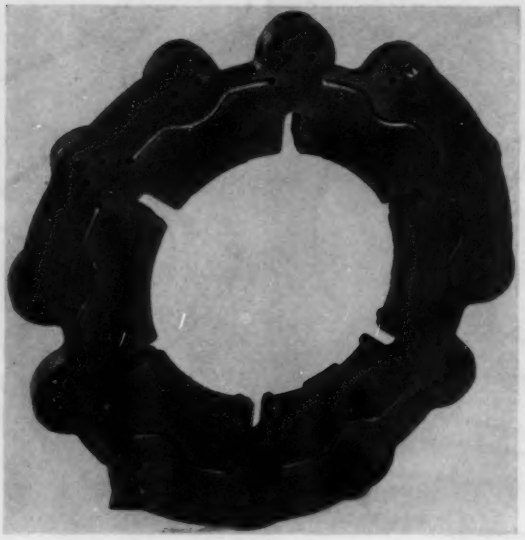


Fig. 4—Sectioned casting showing interior of unlined passages. When required, rougher or smoother surfaces than these can be produced

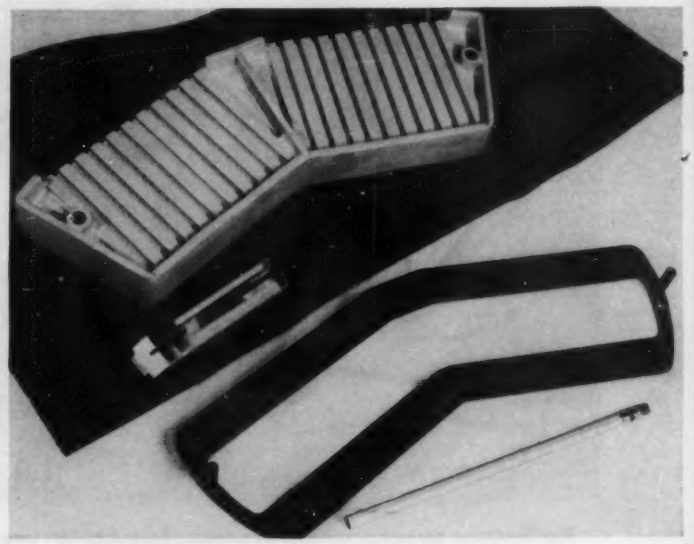


Fig. 5—Casting and model of passageway cast into it. Unlined cores were used because of the small cross-section in the passageway

becomes too great to allow successful use of the sand cores, other processess must be resorted to.

Some processes use refractory materials as the major core material; others use metallic materials. Some processes employ chemical methods of core removal, others mechanical, and still others a combination of chemical and mechanical. When the specified passageway system is not too elaborate, less expensive processes are applicable. More difficult design situations require the use of more expensive techniques.

Dow Metal Products Co. has developed a range of processes to produce unlined passages in light metal castings and to cast in stainless steel tubing. These techniques have been used successfully on a production basis in scores of different designs. Fig. 1 and 2 show a number of shapes that have been cast into production castings. Details of these processes are available to other foundries on a licensing basis.

Design Factors—In discussing design limitations, one must keep in mind that many things are *possible* —and indeed can be delivered—but may be prohibitively expensive. Therefore this discussion is not intended to give absolute limitations, but only to describe that design area within which current skills allow the foundryman to work at moderate costs. Specific design situations lying outside these boundaries may be feasible, depending on how much cost can be justified. These special problems require discussion between the designer and the foundryman.

1. *Minimum Cross-Sectional Area*: For short passages, a cross-sectional area as small as $\frac{1}{8}$ in. in diam or the equivalent is handled without undue difficulty. Naturally, a larger diameter is preferred when the length of the passage becomes very long.

2. *Cross-Sectional Shape*: The cross-sectional shape of the passage need not be round; present methods permit oval, square, or irregular shapes to be handled readily. This flexibility has been found advantageous when space limitations do not afford enough wall thickness to give a passage of adequate volume in a circular cross section. The cross-sectional shape can be varied from point to point along the passage if desired. Fig. 3 shows a core incorporating a variety of cross-sectional shapes.

3. *Variations in Cross-Sectional Area*: Fabrication of the cores for forming unlined passages is much simpler and less costly if the cross-sectional area is constant from point to point along the passage. Economical processes are available, however, which allow the cross-sectional area to be increased or decreased 30 to 40 per cent. Larger variations are feasible, but require rather costly fabrication processes.

It is advisable to blend gradually from one cross-sectional shape or area to another, rather than to have an abrupt transformation.

4. *Bend Radiuses*: Generous bend radiuses are desirable; a sharp, right-angle bend leads to irregularities in the cross-sectional shape at the bend. A minimum bend radius of twice the cross-sectional radius of the passage is desirable, but, as with other generalizations, this limitation cannot be considered absolute.

5. *Side Arms*: Incorporating side arms in the design of unlined passages does not introduce any particular technical problems, and the designer should feel free to specify them where they serve a purpose. He should be aware, though, that production costs in the foundry will be lower to the extent that such complexities of design can be avoided. A simple, unbranched core is easier to fabricate, even if it has an additional curvature or slightly greater length, as necessary, to avoid a side arm. Fig. 3, as well as Fig. 1 and 2, displays unlined passageway models with side arms.

6. *Blind Passages*: Passages open at only one end present difficulty in

the removal of core material from the passage and are not recommended.

7. *Metal Wall around Unlined Passages*: A 3/16-in. metal wall is a good working minimum around unlined passages, and ¼-in. wall gives added assurance of pressure tightness and good casting efficiency in the foundry. This insurance policy can be bought for a relatively insignificant weight increase by "beefing-up" the wall locally around a passage; a general wall increase is not necessary.

8. *Distance between Core Supports*: Provisions for support of a core which forms an unlined passage should be made at intervals no greater than 60D (where D is the cross-sectional diameter of the passage). Passages with core supports at substantially greater distances apart can be produced, but a more costly process usually must be used.

9. *Surface Smoothness*: The normal finish on the interior of an unlined passage is somewhat smoother than a typical sandcast surface. The surface can be made smoother or deliberately roughened on demand. Fig. 4 shows a sectioned casting incorporating a semi-smooth surface.

10. *Dimensional Control*: The location of external openings of unlined passages ordinarily can be held with a ± 1/32-in. tolerance for castings of ordinary size. Obviously, a ± 1/16-in. tolerance is easier for the foundryman to work with, and best economy is served by designing to this tolerance when possible, especially for longer castings. A ± 1/16-in. tolerance on location of the passage at positions between external openings is advisable. Location of the passage between openings generally is less critical to the designer, although ultrasonic inspection makes it possible to check precisely the location of passages within the casting.

A ± 0.020-in. tolerance on cross-sectional diameter of the passage is reasonable.

11. *Alloys*: The processes used to form unlined passages are compatible with any of the common magnesium or aluminum-base casting alloys. It is well to select an alloy having favorable pressure tightness characteristics if the fluids in the passage are to be pressurized.

Fig. 7—The coring for a brake system casting, showing how the hydraulic lines are formed

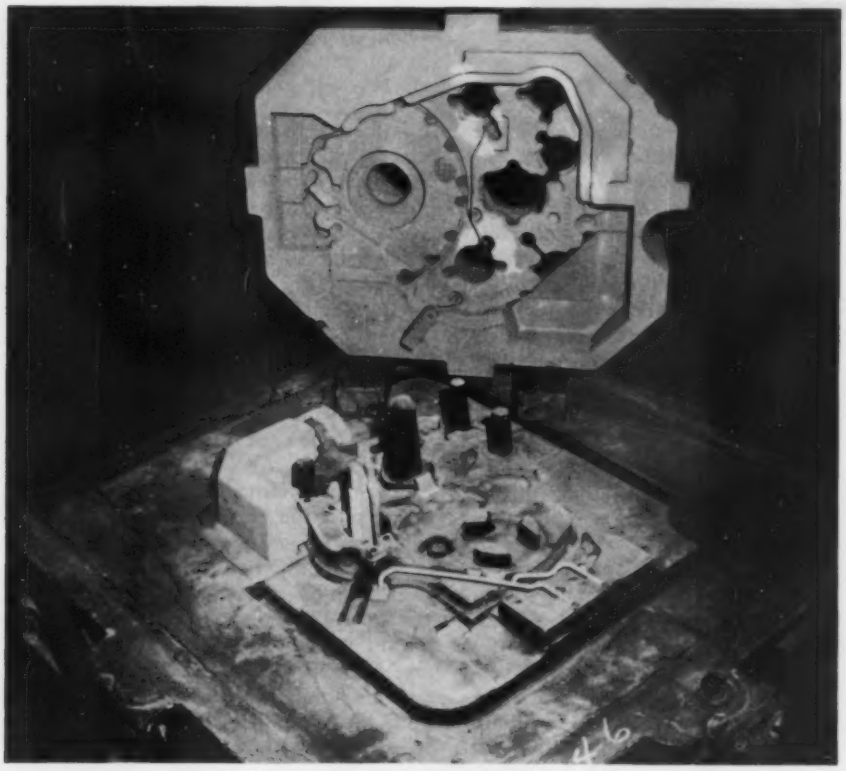
12. *General*: Fig. 1 through 3 illustrate a number of cores cast into magnesium parts to form unlined passages. They show the considerable degree of flexibility offered by processes only moderately costly to apply.

Fig. 5 illustrates a type of passageway that has been produced successfully. This remarkably thin passageway was useful in an application where a heat transfer problem was involved; space limitation did not permit a huskier cross-sectional area of the passage. The process used to make this casting permits the production of castings incorporating unlined passageways with unlimited basic shapes and with practically no limitations on changes in cross-sectional shapes.

Uses—Many aircraft, missile, and automotive applications include hydraulic or pneumatic lines as part of their functional requirements. Unlined passageways cast integrally in magnesium or aluminum sand castings have proved to be an effective means of providing such lines. They offer greater flexibility in design than is possible through machining, take less space, and are less susceptible to damage than external lines.

Fig. 6 is a typical aircraft engine application that incorporates unlined passages, and Fig. 7 illustrates a brake system casting with hydraulic lines formed by this process.

Fig. 6—A mold with cores for producing a typical aircraft engine casting incorporating unlined passages. Flexibility in design of cored hydraulic or pneumatic lines is possible with unlined passageways



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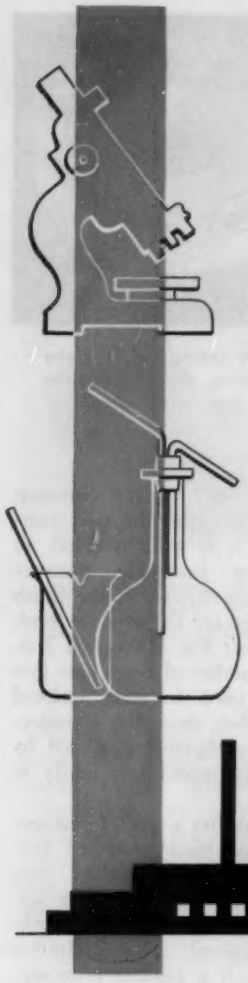

Impact of Educational Trends on the Foundry Industry

This discussion of trends in scientific and engineering education was prepared by the author for presentation at the 1960 College-Industry Conference of the Foundry Educational Foundation

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● SCIENTIFIC and engineering education in America is changing, and the power of this change can be harnessed to advantage by the foundry industry. The impact of these changes can be brought to bear immediately, in orderly evolutionary fashion, or the foundry industry can ignore opportunity until the pressures of progress bring about changes in more revolutionary fashion.

It is not heretical nor unfair to observe that metal casters, taken as a group, have clung far too long to the belief that knowhow and experience are superior to science and technology. There always has been, and still is, a severe lack of comunication and understanding between practical and technical men; to my knowledge no perfect solution has yet been found for fitting a first-class technical staff into a foundry operation. There is always the question of whether technical or practical decisions prevail because there is seldom a knowledgeable man in control who can evaluate the two extremes objectively and take repeated action while still maintaining a smoothly running organization.

Typical of the problem is the question of whether quality control should be the final decision and responsibility of the technical staff or the plant manager, foreman, or superintendent. Co-operation, communication, and mutual understanding are simple-sounding requirements but elusive quantities in day-to-day foundry operations.

In a sense, education and educational trends are everybody's business. So much verbal pressure has been directed to foundry supervisors, managers, owners, and board chairmen, urging them to climb upon the bandwagon of technology, it will not be surprising if they consider still another plea as anticlimactic. With each passing year, however, pressures for change increase and evidence of the need for change becomes more clear; so another short, shrill whistle may catch a high-pitched ear.

Time Grows Short — European competition is evidence that time grows short. Not only are castings already being imported, but the trend in brokerage interest seems to be increasing. Also, we know that European foundries have been far ahead of us in their utilization of engineers in management positions of real responsibility. One Belgian steel foundry sends a man each year to MIT for advanced training toward his master's or doctor's degree; all expenses are paid for him and his family, with specific directions to live well. These men are fully the equal of our best men in

practical experience and are so well trained academically that they finish their studies with grades in the upper tenth of our graduate school body.

Now to explain the meaning of some terms which will be used from time to time hereafter. For example, the terms "technical man" or "engineer" mean different things to different people. A foundry may feel it has an adequate and excellent technical staff or engineering department if it has one very capable metallurgist who graduated with honors from a college or university in 1935 and an able engineer of similar vintage. It will, no doubt, be overlooked that these men have been kept so busy in the day-to-day operations of the shop, that it has been impossible for them to keep up to date in their professions. Even if they have found time, their efforts will be less than entirely adequate because science and the science of engineering have changed so much and so rapidly. Since reference is to the future, let us discuss the post-1960 graduate engineer, who will be among the first to experience the impact of modern educational trends.

There Are Exceptions — When reference is made to failure of our American foundry industry, or our American foundrymen, to appreciate, utilize, encourage, aid and abet higher education, it is not meant to ignore the outstanding efforts of some men and some companies; it is only intended to point out that they are the exception and not the rule.

Emphasis on the need for improved quality and dependability in the castings of the future refers not only to types of castings being made today and used for strategic applications, but also to castings so complex and strong they have not as yet been made.

Statements that students and consumers are becoming increasingly castings conscious as well as quality conscious, and that students are becoming more and more oriented toward ownership of their own foundries, are made only on the basis of the author's experiences with industry and as a teacher at MIT. These same observations may not impress others in the same way.

A Forecast of Things To Come . . .

- Engineers and scientists will play important roles in shaping the future of cast metals. The engineer will play his role directly by making castings or designing them into engineering structures, and will share with the scientist in development of fundamental knowledge through research.
- Science and engineering must soon replace the art-and-crafts aspects of foundry operations.
- Higher mechanical properties and increased soundness and dependability will be required of castings, and designs will be more complex and demanding.
- If foundries, as we know them today, do not respond by providing the increasingly critical needs of industry, a grass-roots movement may evolve with emergence of a new type foundry better geared to the challenge of the future. Unless one or the other situation develops reasonably soon, there will be a lot of European castings on American soil.
- High-quality castings have intrinsic properties of economy, versatility of design and composition, esthetic appeal, and performance in service which are not exploited to the fullest by our industry. Research is constantly bringing these qualities into focus; the men best qualified to explain and prove these points to a customer are highly trained engineers.
- The Foundry Educational Foundation has played a very significant role in the encouragement of foundry training in colleges and universities. It is important to emphasize that the appeal of the Foundation to institutions of higher learning was the first and only successful attempt by a branch of industry to bring about a concerted interest specifically in its behalf.
- The Foundation must have much more active support from industry to carry on its work, and somehow more foundries must be brought to realize the potentially tremendous impact of engineering science on their industry—to the point that they will encourage education and research by liberal financial support and by employing engineers to put their learning to practice.

And last, but not least, if the author seems to assume the role of an industrial alter-ego and to overemphasize that the metal casting industry is low man on the technological totem-pole, he does so with the firm conviction it is nevertheless one of the most important branches of basic industry and a good place to work (whether as engineer, entrepreneur, or laborer).

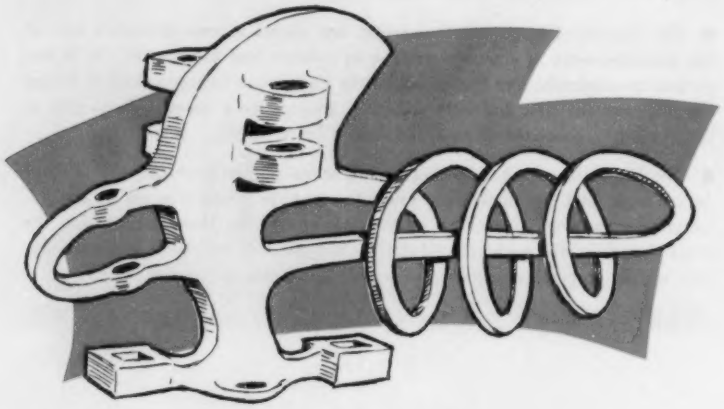
Observations — The impact of modern educational trends on the foundry industry of the long-range future will parallel the influence science already has had on many backward branches of basic industry. Ultimately it should alter the status quo in such a way as to make the industry technologically unrecognizable as we know it today. Some of our more up-to-date foundries in America will adjust to the transformation, but those not psychologically attuned to the pressing need for drastic and continuous change will suffer.

This is not an encouraging picture for most of our 5000 or more foundries, but it signals an era of development at the end of which time castings will be made with the versatility, integrity, economy, and performance which will make them more competitive with engineering parts made by processes currently in better favor with the consumer public.

Let us examine, first, just what this so-called "new look" in education really is, dealing specifically with how and why it will affect our industry. Within our life times (or at least the life times of the older ones of us) we have already seen two "new looks" in education: 1. The days when Readin', Writin', and 'Rithmetic were considered the basic essentials for the good life,

and a high school education was reasonably adequate preparation for a well paying and respectable niche in society; 2. The era in which chemistry, mathematics, physics, and a bachelor of science degree from a college or university were minimum requirements. Now we have an entirely new gamut of educational "musts" for the whole man, and a simple bachelor's or master's degree is rapidly becoming poor relation to the doctorate.

With each of these educational upgradings has come the need for making courses increasingly quantitative in nature and cramming more and more of them into our curriculums; finally, and this is the stage in which we are currently engaged, we have about reached the limit of courses we can squeeze into a normal work week without turning students into schizophrenics, so we turn to yet another alternative—we condense our courses, making them more and more intense, cutting out anything that smacks of arts and crafts, or what the public generally considers engineering, and reducing everything to as small a quantitative package as possible. Science becomes more and more complex and all-embracing and engineering becomes steadily more scientific.



Castings more complex than any made today will be produced by foundries in the future. Well trained engineers are needed to make such castings

An Earlier Start — To set the stage for an accentuated higher education it will be necessary to indoctrinate our budding young scientists and engineers with the substance and complexities of science earlier and more effectively in high school and somehow get them to work harder and longer; schools of higher education will become increasingly more selective in their admissions policies, and we will probably see an increase in the amount of time per year spent in studies.

To resurrect some of the more practical training formerly available, it is possible one or another form of co-operative effort will evolve where the student will spend his summer in a research laboratory or in some branch of industry in America or abroad. The more extensive use of practice schools may evolve in which the student will get practical training in special laboratories; this has proved very successful in training chemical engineers at MIT.

This overly brief, thumbnail view of modern educational trends indicates the type of engineer or scientist to be expected immediately from some schools and eventually probably from most schools; also it implies the impossibility of there being men graduated en masse from colleges or universities with the specific label of "foundry engineer." With or without the label, however, many of these engineers and scientists will have a high degree of sophistication in the metal casting field and potentially will be even better trained men than have heretofore been available.

With the need for adding more intense courses in increasing numbers over the span of an academic career, there must naturally be less time for specific courses in any given field. This has been the case at MIT since the inception of its foundry program and has never been a handicap — all foundry courses are elective with only one intense laboratory and lecture series of three-weeks' duration being required of undergraduates.

Influencing Factors—The impact of modern educational trends and of the future engineer in the foundry industry will be influenced by many things—some intrinsic, or within the industry, and some extrinsic, or outside its control. The more important of these are discussed below:

1. *Training and Specialization*—The student of tomorrow will be more intensely trained and more specialized than his predecessors. He will be more intellectually versatile because he will be screened more carefully initially and will be held to more rigorous standards of academic performance. He may be some degree more of an egghead than his earlier counterparts and will resemble less and less what has become the image of the engineer. He will have all the fundamental knowledge a good engineer needs, and whether or not he will succeed in a foundry depends mainly on his interest, enthusiasm, and environment.

This all poses a problem! It would appear that many of the better engineers of yesterday and today were already too highly trained for our foundry industry. This is indicated because of the relatively small numbers of engineers with advanced degrees employed by foundries; it can also be inferred from the attitudes of many foundry managers who feel the type man they need most is a technician from a trade school.

Another bellwether is the difficulty the Foundry Educational Foundation has experienced raising funds for its scholarship and college-aid programs, while there seems to be great enthusiasm for technical and trade school training. A trade association seems to fare much better than one devoted to educational programs; even our so-called foundry technical associations would rather spend their

money on other pursuits than on basic research or higher education.

So, what about the man who is even better trained? His future as a foundryman within our existing foundry industry lies entirely with the industry; fortunately, however, his total impact on the metal casting field is not in the hands of the industry, for he may decide to go in business for himself. Before a highly trained technical man can prosper and be effective in a foundry, he must be appreciated and used intelligently by management; the management must also be able to command his respect. This means he must report to an extremely able or understanding supervisor in a line position or to an equally able management man in a staff position.

To use a well worn cliche, a race horse should not be used for plowing; nor does he respond well to an over-anxious and over-heavy hand on the bit. I do not mean management should give a carte blanche endorsement of all eggheads only because they are smart and well-trained—some simply will not fit in foundry work; these men should be recognized and asked to look for new employment.

What It Will Take—The future generation of highly trained engineers and scientists are the men who will provide the important breakthroughs needed to enhance the scope and standing of the foundry industry; technicians are important people but they cannot accomplish this particular task. Engineers should be encouraged in every way possible by the foundry industry early in their academic life and should be employed and used effectively after graduation.

The most serious shortcomings of industry are its lack of individual and collective encouragement to higher education and failure to use graduate engineers effectively. This shortcoming is most particularly evident from the experiences doctorate men continue to have with employment in the castings industry. Many of those who have taken positions in foundries have found their talents and interests unchallenged; when they seek new employment they seldom find a suitable spot in the foundry industry, and take positions in other fields, even though they have not lost their original interest in the foundry.

It may be too early to expect large numbers of such jobs to be available in foundries, but the sooner they become available, and the sooner the talents of doctorate men can be utilized to full advantage, the stronger the industry will become.

2. *Broader Knowledge*— The new engineer will have an excellent working knowledge of the structure, properties, and performance of engineering materials and will appreciate the intrinsic advantages, limitations, and economics of casting as a means of fabrication.

Many foundries, even the better ones, have been forced into defensive positions when their castings are compared with forgings or weldments. Their plant metallurgists and engineers often have not had the training in college which compared the materials of construction critically and quantitatively, for only relatively recently have schools included a foundry laboratory of consequence and a course or more in metal casting in their curriculums; properties of wrought products and weldments have been much more generally taught. This has led engineers to be uninformed and unimpressed by the properties and advantages inherent in castings, and has caused designers to overlook or decide against castings as their material of construction.

The man trained to appreciate the economic and engineering advantages of castings is a great asset to our industry whether or not he becomes a foundryman; in fact, the engineers who design and buy castings will probably have more impact on our industry than the men who become foundrymen, simply because there are more of them. This presupposes, however, that enough of these engineers become casting makers to enable foundries to obtain the intricacy, properties, delivery dates, economy, quality, and over-all integrity in their castings that will be demanded by the industries of tomorrow.

3. *More Business Minded*—Tomorrow's engineering graduate will be more business minded and more oriented toward ownership of his own foundry than has been true of his predecessor.

This is a natural consequence of our present tax structure, which places a heavy burden on incomes other than capital gains. Although our colleges generally do not yet recognize the engineer's need for training in economics, many men are taking elective courses in business. This means that the man you hire may be serving a self appointed apprenticeship while he looks toward ultimate ownership of his own small foundry. This is not necessarily an undesirable situation because, while the business-minded engineer is learning, he will be working hard, and an alert management can gain much by having such a man for only a few

Many graduate engineers employed in foundries find their talents and interests unchallenged because their training is not used effectively

short years. The obvious way to make the most of this situation is to adopt a "blueberries for the birds" policy—new men should be in training either as regular or summer employees to replace those lost by this form of attrition; the analogy stems from the fact that if one raises blueberries and wants some to keep, he must also arrange to raise some for the birds.

4. *A New Attitude* — Engineers will have a completely new attitude toward metal casting and cast metals and will be particularly quality conscious. This will not only be true of the foundry engineer but also of the design engineer and consumer.

Interest in foundry phenomena involved in making castings has developed in recent years quite apart from any direct connection with the foundry industry. The development of titanium as a promising metal of the future introduced a novel casting problem—the absolute need for vacuum or controlled atmospheres during melting and pouring and a troublesome problem with refractories stemming from the extreme reactivity of the metal. In fact, no fully satisfactory solution to the refractory problem for casting pure titanium has been devised to date.

The need for liquid metals as heat transfer media in atomic reactors brought engineers face to face with the need for knowledge about the melting and freezing of metals and their interface and heat transfer characteristics. Current interest in zone refining and in the growth of unidirectionally solidified metals and single crystals for transistor and magnetic applications requires fundamental understanding of solidification phenomena.

More closely allied to practical casting problems are the experiences engineers are having with complex components of aircraft, guided missiles, ordnance materiel, atomic reactors, powerplants, and critical oil refinery machinery. There is increased awareness on the one hand of the design advantages and economics of castings, and on the other of the unfortunate experience that castings are not always sound and dependable in strategic applications.

There is also a growing awareness that in the future we cannot afford to waste our resources as liberally as we have in the past; this is good for the foundry industry because, in general, castings are the most economical route from raw material to finished product—good, that is, if foundries incorporate all the integrity and versatility possible in their products.

This means more research, more engineers of the type discussed above, more imagination, more hard work, much more concern with quality, and a really effective sales and development program. The future and current crop of highly charged graduates can do

Foundry personnel often find themselves in the lower corner of the organizational chart

all these things—they need only employment, encouragement, support, and freedom of action, and someone in management with desire to get the job done.

What It Takes—If the metal casting industry as a whole worked as hard at converting engineering components to castings as their competitors do in converting castings into other means of fabrication, and then made castings sound and dependable, the industry would grow rapidly, both in prestige and dollar volume. As an example, if 1 per cent of all the parts made of wrought steel today were converted to castings the steel casting industry would double in size. There have already been outstanding examples of conversion of engineering components to castings, but this important phase of foundry engineering should be greatly expanded. It is a job for the able sales engineer or for the salesman and engineer working together.

More specifically, what will be the ultimate effect of the engineer's new attitude toward castings and the awakened interest in quality? Either he will find sympathetic acceptance in our industry and will help bring about the engineering improvements needed or he will start a grass-roots movement on his own. He will be a prime candidate for starting a captive foundry for some manufacturing concern experiencing difficulties with local foundries in obtaining the quality of product and delivery dates required.

Reversing the Trend—The trend away from operation of captive foundries may well reverse itself if and when enough castings-conscious, able, young men are available to replace the art, craft, and guesswork of foundry practices with science and sound engineering. The old feast-or-famine nature of the foundry business may disappear as corporate structures continue to grow larger and larger and foundries become a streamlined, respected, and well engineered branch of a bigger business; in the past it has been customary for fat, pompous, and unsympathetic management structures to be built on the back of a poorly manned, poorly engineered, and poorly equipped foundry.

To look at the organization charts of many of our large businesses built around captive foundries, one finds the personnel of the entire foundry operation, upon which the business rests, occupying about 6 square inches in the lower left hand corner of a 6-square-foot spread; moreover, graduate engineers and high-level management men will seldom be found in the 6 square inches in the lower left hand corner.

The foundry of the future, whether captive or otherwise, must be better engineered, better manned, better respected, and better treated by management, and must produce much better castings. This will require well trained engineers in large numbers.

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Shown here are two types of patterns. The wood pattern, below, is used to mold only a few castings. The metal pattern, which is mounted on a matchplate with permanent gating, is used to make long runs

Factors To Consider When Buying Castings

Author discusses three basic factors which are considered in buying castings—price, quality, and service. A procedure for evaluating casting methods and selecting pattern equipment also is described

By LOUIS IANNETTONI

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● IN THE MAIN, castings are purchased on the basis of three factors—price, quality, and service, three requirements which can be applied in general to almost any standard materials purchased.

Casting buyers not only have the responsibility of placing casting orders, meeting production schedules, negotiating casting quality, and knowing a particular foundry's limitations, but also must select the casting method and the proper patterns or casting dies. These responsibilities require purchasers of castings to have an adequate background knowledge of foundry processes and techniques. Since this requirement calls for foundry experience, the services of a casting engineer or a foundryman should be employed to help make the correct decision.

Patterns—Basically, patterns or dies are tools used in the production of castings. These tools should be purchased to do the best job for the least cost.

The first decision is whether the castings are to be made in an expendable material, such as sand or plaster, or in metal molds. If the choice is for an expendable mold, a selection must be made from wood, metal, or plastic patterns. It is apparent, therefore, that the purchasing agent must be able to analyze the suitability of available casting methods and pattern equipment for the job he has.

Pattern Equipment — There always have been differences of opinion in interpretation of pattern requirements necessary for production of castings in the foundry. For this reason, to aid purchasing departments in establishing a criterion for buying, Westinghouse uses the following classifications:

Class 1—Temporary pattern: 1 to 10 molds.

Class 2—Low activity for short life: 25 to 100 molds.

Class 3—High-activity pattern for short life: 100 to 500 molds.

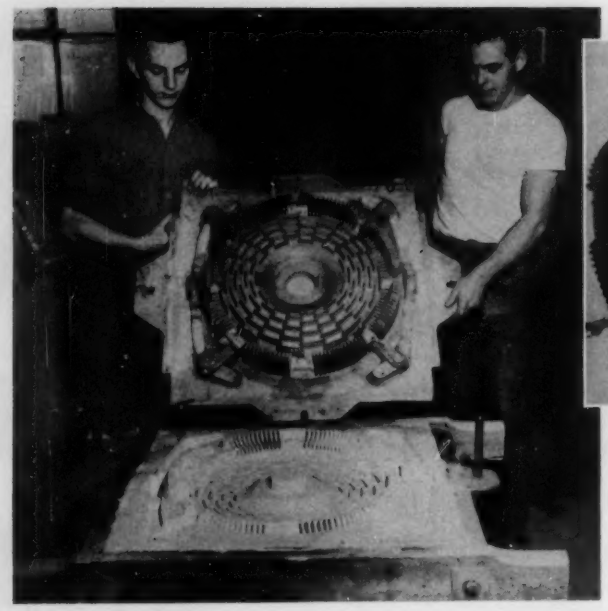
Class 4—Low-activity permanent pattern: 500 to 5000 molds.

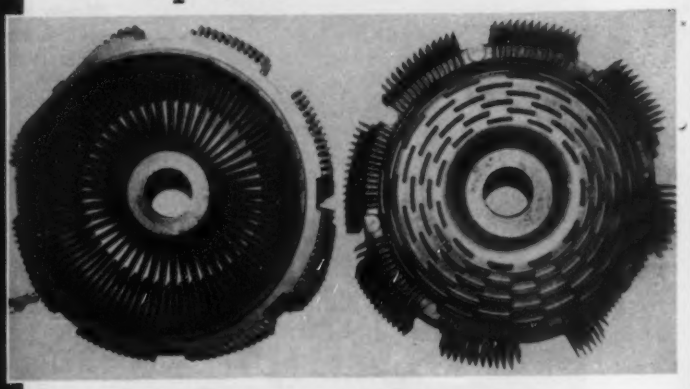
Class 5—High-activity permanent pattern: 5000 molds or more.

Class 6—Diecasting, permanent molding, investment casting, and others.

Construction of Patterns—Temporary patterns for casting quantities from 1 to 10 molds (Class 1) may be constructed of softwoods. It is recommended that hardwoods be used for light castings of intricate design. This type of pattern

CO_2 CASTING





Left—Workers prepare to close a mold made by the CO_2 process. Two views of the casting which was made in this mold are shown on the right

should be employed only for minimum quantities such as replacement parts, jig making, prototypes, or master patterns that can be disposed of immediately after use to eliminate storage problems.

Low-activity patterns for low life from 25 to 100 molds (Class 2) lend themselves to a variety of construction. The foundry usually decides on the type of pattern it requires, based on the method to be used in molding. Generally, split hardwood patterns may be used. It is recommended that these patterns be mounted on metal or wood plates. Permanent gating should be employed when it is feasible.

High-activity, short-life patterns for quantities up to 500 (Class 3) preferably should be constructed of metal. In some instances, Class 2 equipment may be used provided that the wood patterns are faced with metal and of sturdy construction. In Class 3 equipment, production ranges are being approached in which fixtures are required for pasting, rubbing, and setting of cores to maintain uniformity in casting production.

Low-activity permanent patterns for quantities below 5000 (Class 4) should be of metal. In some instances, hardwood patterns, metal-faced and mounted on metal plates, may be used. Metal coreboxes rigged for production quantities are recommended. For Class 4 equipment, the need for fixtures and gages as described in relation to Class 3 patterns is more critical. Permanent gating and risers should be included as part of the equipment. This equipment may be of the same construction as Class 5 patterns, depending on the design of the casting and tolerances required.

High-activity, long-life patterns (Class 5) generally are of all-metal construction. This equipment usually consists of the following: 1. Metal matchplates. 2. Metal patterns mounted on metal plates. 3. Cope and drag metal patterns. 4. Metal coreboxes rigged for blowing or other high-production techniques. 5. Metal fixtures and gages to maintain casting reproducibility in molding and coremaking. 6. Permanent gating, risering, and pouring systems. 7. Inspection gages and fixtures.

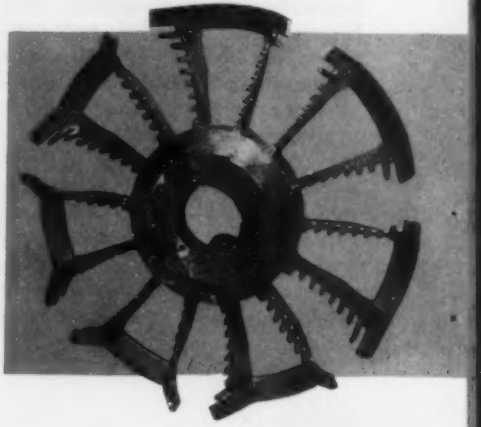
When aluminum patterns are used, it is advisable to face with steel such wear areas as flask bearing surfaces, core prints, and loose-piece seals. Class 5 equipment also should include core driers and their respective patterns. (Use of the CO_2 process core method has eliminated core driers on many jobs.) Shell molding usually requires Class 5 equipment.

Diecasting, permanent molding, investment casting, and other Class 6 casting methods usually require specialized pattern or die equipment.

When large production quantities are anticipated and costly equipment is necessary, services of a casting engineer or foundry specialist should be employed. Often, because of the versatility and intricacy of various casting techniques, appreciable savings can be realized by slight modifications in the design of the raw casting. It is important, therefore, that purchasing agents and their respective engineering personnel consult with the foundries quoting on specialized equipment to expedite proper liaison and to obtain the most economical castings and tooling.

Negotiating Pattern and Castings—Selection of patterns cannot be based on cost alone. A complete description of the patterns to be purchased should be quoted in de-

SHELL MOLD CASTING



tail. Knowing the method employed by the foundry sometimes is important because a better comparison can be made of the various suppliers' quotations to determine which method is most favorable relative to expected casting performance and costs. Good liaison between purchasing, casting design engineers, manufacturing, and the supplier leads to procurement of proper tooling and the expediting of a good casting supply.

Effective communication is a prerequisite to sound quotations. Because of the importance to both casting buyers and casting producers of securing necessary information, consideration should be given to engineered purchasing requirements. The Gray Iron Founders' Society has developed a recommended form which can be used by industry. It can be obtained from the Gray Iron Founders' Society, 930 National City-East 6th Bldg., Cleveland 14, Ohio.

In the purchasing of casting and pattern equipment, casting buyers should avail themselves of the engineering services rendered by foundries. Most successful foundries realize that one of the important factors in casting sales is service. The foundry always should consider the possibility of aiding purchasing agents in cost reduction ideas such as better pattern designs that will improve the castings and reduce cost to the casting buyer.

In view of the technical aspects of this type of purchasing and its difference from ordinary catalog purchases of standard equipment, where can casting buyers get assistance?

Large companies can afford to employ a casting engineer; small organizations depend on foundries for their help. In either event, a foundry specialist or casting engineer should be consulted when inquiries are placed and supplier quotations interpreted, especially on high-production and complex castings.

To be of value to the purchasing agent, the casting engineer must be familiar with the company product, plant machining operations, supplier problems, and field failures. This familiarity permits the casting engineer to recommend optimum selection of alloy or specification, casting method, and practical tolerances for a given casting. The casting buyer then is in the position to select the casting supplier.

Casting Analysis—Purchasers of castings may realize cost reductions and save their respective organizations much expense by a casting analysis technique. The approach to this type of program is relatively simple: It is a cost reduction program through engineered purchasing. This analysis may be accomplished by a consideration of the following aspects:

1. Specifying: a. Selection of the right material. b. Review of tolerances and elimination of unnecessary tolerances which add to casting costs.
2. Process: Selection of the proper casting method—sand, permanent mold, diecasting, investment, etc.
3. Patterns: Making sure that the proper equipment is purchased for the job—that is, equipment which will meet production and quality requirements most economically.
4. Foundry Services: Determination of what can be done at the foundry to reduce manufacturing costs—for example, rough machining, painting, targeting, etc.
5. Quantity Releases: Taking advantage of lower costs for given price break in quantity purchases.
6. Redesign: Review of production requirements periodically since development jobs or low-activity designs sometimes become more active. The opportunity presents itself for redesign of casting, process, or pattern equipment, with resultant cost reductions.
7. Quality: Keeping a record of casting suppliers' quality performance. Rating of foundries for their ability to correct defects (service); maintain quality; produce complex or simple castings; and meet military and other engineering requirements.

Using this suggested procedure for evaluation of a casting method and the selection of pattern equipment, purchasers can approach optimum procurement of castings.

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Castings made by five molding processes are shown. The decision to use one or another of these processes can come only after careful consideration of such factors as cost, tolerances, quantity, and quality

Combined Method of Analysis

For High-Alloy Iron and Steel

A single sample is analyzed for seven elements by the procedure outlined in this article. For a combination of speed and accuracy, colorimetric, gravimetric, and volumetric methods are used

By W. B. SOBERS
Chief Chemist,
Research & Development Div.
Chain Belt Co., Milwaukee

● A RAPID METHOD of analyzing high-alloy irons and steels is important in this day of exacting specifications for heat and corrosion resistant cast ferrous alloys.

This article outlines a procedure which will serve to analyze for silicon, manganese, phosphorus, chromium, nickel, molybdenum, and copper, using a single sample and dilution techniques. By eliminating the weighing and dissolving of several samples, time, chemicals, and laboratory space are saved. For a combination of speed and accuracy, colorimetric, gravimetric, and volumetric methods are used.

Before proceeding, it is necessary to point out that the analyst should concern himself with the application of the material with which he is to work. If possible, he should be familiar with the history of the sample so that he can apply this knowledge to his test methods.

Often, to produce a satisfactory product or to obtain the desired information, a complete chemical analysis of the material in question may not be required. A spot check for three or four elements may suffice. A high degree of quantitative accuracy may not even be necessary; a determination of plus or minus 5 per cent might be sufficient. In some cases, qualitative analysis or even a physical test may be satisfactory for the job requirements.

These factors should be taken into account by the analyst when he is planning the procedure for testing a specific sample. The following outline is for determining the seven elements, mentioned previously. Obviously, if a particular element is not involved, the analyst can eliminate the test for that element. Also, the analyst may incorporate any of his own methods and techniques if they better fit his needs or equipment. This procedure results from modifications of methods outlined in references 1 through 7 for analyzing low-alloy irons and steels. The first step in the procedure is the preparation of the master solution from which aliquot samples are taken for the various determinations.

MASTER SOLUTION

Weigh a 1-gram sample of the steel to be tested and place it in a 150-ml beaker. Add 20 ml of hydrochloric acid and 10 ml of nitric acid, cover the beaker, and heat. Other acid mixtures may be used to dissolve the alloy depending on the solubility or type of alloy. After the sample has dissolved, add 10 to 15 ml of perchloric acid and evaporate until only 1 or 2 ml of hot, fuming liquid remains.

Remove the beaker from the heat and use a burette to add 1.0 ml perchloric acid. Then, add carefully 40 ml of water and bring the solution to a boil. At this point, the solution should be clear; if not, too much of the sample was evaporated. Dilute the clear oxidized solution to approximately 100 ml. Filter the liquid to eliminate the silicic acid, catching the filtrate in a 200 ml volumetric flask.

Wash the beaker with hot water and filter this wash water, also. Do not scrub the silicic acid from the beaker at this point but save it for the silicon determination. Wash the filter paper several times with hot water, or until the total volume of filtrate is just less than 200 ml. Remove the volumetric flask from under the funnel, dilute the contents to 200 ml, and mix. This is the master solution. At this point, 1 ml of solution contains 0.005 grams of the test metal.

From this master solution, we

take aliquot amounts by means of pipettes for the various determinations. Size of the aliquots depends on the alloy concentration and method selected for determining the element involved.

SILICON

After removing the master solution from underneath the funnel, scrub silicic acid from the 150-ml beaker onto the filter paper used for the original solution. Wash the residue on the paper several times with hot, dilute HCl (10 per cent solution), then wash it several times with hot water. Ignite the filter paper and weigh as SiO_2. A simple calculation will yield the amount of silicon in the 1-gram sample.

MANGANESE

From the master solution, transfer 20 or 40 ml, depending on manganese content, by pipette to a 250 ml wide-mouth Erlenmeyer flask. Add 10 ml of perchloric acid and a glass bead. Boil until white fumes come from the mouth of the flask. To the hot, fuming solution, add approximately 0.5 grams of sodium chloride which will eliminate chromium in the form of chromyl chloride. Reheat the solution until fumes again start coming from the mouth of the flask. The orange-yellow color should disappear completely. If it doesn't, add another small amount of sodium chloride (0.1 or 0.2 gram) and again heat until fumes appear.

After chromium has been thus eliminated, continue boiling the solution until just before it becomes dry. Remove the sample from the heat, and add 1 ml of perchloric acid plus about 60 ml of water. Boil the solution for two or three minutes and then add 10 ml of silver nitrate solution and five or six drops of phosphoric acid. When the boiling solution clears, add 15 or 20 ml of 10 per cent ammonium persulfate solution. Digest the solution over warm heat until it effervesces. Adjust the volume to approximately 100 ml. Cool the solution to room temperature and titrate with standard sodium arsenite solution. One ml of arsenite solution indicates 0.1 per cent manganese when a 40 ml sample is taken from the master solution.

For high-manganese alloy steel (Type 201-202), transfer 20 ml of master solution to a 100-ml volu-

Front to rear, left to right:

First Row—Sample A (cast stainless steel spray nozz.e); gravimetric silicon determination, master solution (200 ml); colorimetric chromium determination, 1-mg sample; 100-mg sample from master solution diluted to 1000 ml for colorimetric chromium and high nickel determinations.

Second Row—Sample B (roller chain, various types of stainless steel); glassware in same sequence as in first row.

Third Row—100-mg sample for Mo, Sample A.

Fourth Row—10-mg sample for high Mo; 100 mg from master solution diluted to 100 ml for high Mo, Sample B.

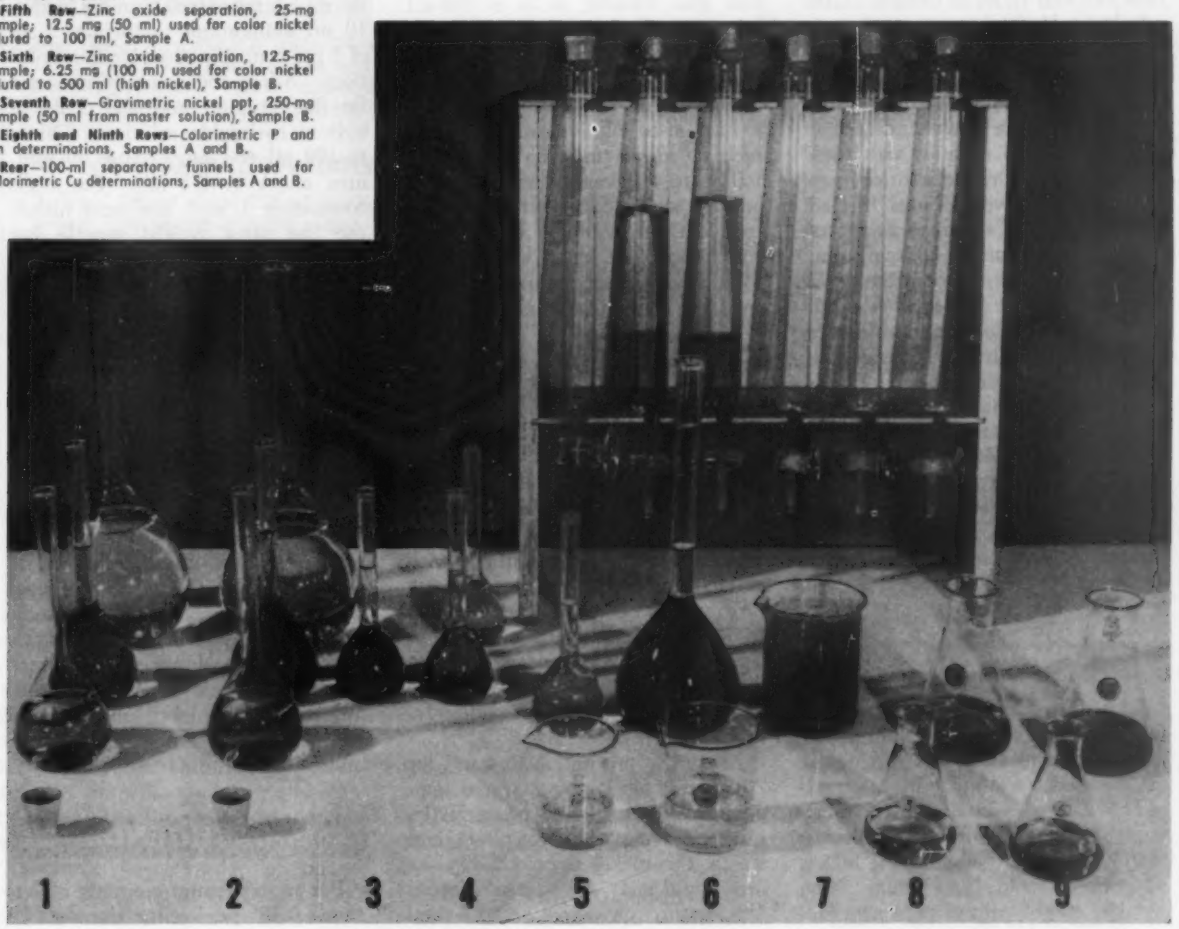
Fifth Row—Zinc oxide separation, 25-mg sample; 12.5 mg (50 ml) used for color nickel diluted to 100 ml, Sample A.

Sixth Row—Zinc oxide separation, 12.5-mg sample; 6.25 mg (100 ml) used for color nickel diluted to 500 ml (high nickel), Sample B.

Seventh Row—Gravimetric nickel ppt, 250-mg sample (50 ml from master solution), Sample B.

Eighth and Ninth Rows—Colorimetric P and Mn determinations, Samples A and B.

Rear—100-ml separatory funnels used for colorimetric Cu determinations, Samples A and B.



metric flask, dilute, and mix. Now, 1 ml of solution contains 1 milligram of dissolved test material. With a pipette take a 40-ml sample from this diluted solution and place in a 250-ml wide-mouth Erlenmeyer flask and eliminate chromium as before but use less sodium chloride. Finish as outlined above for manganese. In this case, the titrated solution contains 0.04 gram of the steel, and 1 ml of arsenite solution indicates 0.50 per cent manganese.

PHOSPHORUS

Transfer 10 ml of master solution to a 125-ml Erlenmeyer flask. Add 10 ml of perchloric acid and a glass bead. Eliminate chromium as outlined for manganese, using less sodium chloride (0.1 or 0.2 gram). Boil the chromium-free solution almost to dryness, add 2 ml of perchloric acid and approximately 10 ml of water, and boil for a minute or two.

Remove the solution from the hot heat and add 15 ml of sodium sulfite solution. Heat this solution gradually until it bubbles and the iron is almost completely reduced. Add 15 ml of ammonium molybdate-hydrazine sulfate reagent, digest at 90° C for 7 or 8 minutes and bring just to a boil. Or, the solution may be boiled for two minutes instead of digesting for a longer period of time at just below the boiling point.

After cooling it to room temperature, transfer the solution to a tall form 50-ml graduate and dilute to 50 ml with water. Transfer the solution back to the original Erlenmeyer flask and mix. Use a wave length of 650 mu on a spectrophotometer to determine the content of phosphorus. The blue phosphomolybdenum color is stable for several hours. The same curve as plotted for plain carbon steels may be used.

CHROMIUM

From the master solution, transfer 20 ml to a 1000-ml volumetric flask, dilute to 1000 ml (tap water can be used), and mix. Place 10 ml of this diluted solution in a 200-ml volumetric flask containing approximately 75 ml of water and 2 ml of phosphoric acid and mix. Mix in 10 ml of diphenyl carbazide solution and allow to stand for five minutes. Then, dilute to 200 ml and mix.

After 15 minutes, check the composition, using a wave length of 530 mu. The chromium curve is plotted by using standards of similar composition. A chromium curve plotted for low-alloy steels may be used, however, if a correction factor is applied. For samples having less than 10.0 per cent chromium, use a proportionally larger sample. With chromium contents higher than 20.0 per cent, either dilute the solution or decrease the sample proportionally.

A direct colorimetric method for chromium is alternative to the above method or it may be used when only chromium analysis is desired. Weigh a 0.5 gram sample and place it in a 250-ml beaker. Add 50 ml of phosphoric-sulphuric acid solution, cover the beaker, and boil gently until the sample is in solution. Oxidize with several drops of nitric acid and boil for two or three minutes. Cool the solution to room temperature and transfer it to a 100-ml volumetric flask. Dilute the solution to 100 ml and mix. The stable green color is checked at 452 mu.

High-sulfur stainless steels may be hazy after solution and oxidation. Such a sample may be cleared by boiling to a lower volume. If salts start to separate, add a little water and continue boiling. If the solution is not then clear, evaporate to a low volume a second time. Repeat until the solution clears.

NICKEL

From the master solution, transfer 25, 50, or 100 ml (depending on the amount of nickel present) to a 400-ml beaker. Add 10 ml of 40 per cent citric acid. While stirring, neutralize the solution with ammonium hydroxide and add approximately 1.0 ml in excess. Dilute to 300 ml with hot water, and precipitate the nickel, while stirring vigorously, with 20 or 40 ml of a 1 per cent solution of dimethylglyoxime.

Allow the precipitate to stand for 20 minutes or longer at room temperature while stirring occasionally. Filter and dry the precipitate and weigh it as nickel glyoxime. Or, the precipitate may be ignited (avoid temperatures above 1200° F) and weighed as nickel oxide. Weighing as the oxide tends to give lower results than weighing as nickel glyoxime.

Low and high nickel alloys can be analyzed by colorimetric means, also. The nickel curve is plotted using standards of similar composition which have been tested by the same procedure.

For steels with less than 1.0 per cent nickel, transfer a 5.0-ml sample of master solution to a 150-ml beaker containing 3 ml of zinc oxide emulsion solution and twirl the beaker to mix. Add 92 ml of water using 100-ml tall form graduate and mix thoroughly with a glass rod. Then, allow the precipitate to settle. If insufficient zinc oxide solution has been added to percipitate the iron and chromium, add a few drops more.

Decant 50 ml of the clear solution into a 50-ml tall form graduate and pour it into a 100-ml volumetric flask containing 3 ml of tartaric acid solution. Add the following reagents and mix after each addition: 10 ml of saturated bromine water, 10 ml ammonium hydroxide, 3 ml of 1 per cent dimethylglyoxime solution. Allow the solution to stand for five minutes and add 5 ml of sodium hydroxide solution. Dilute to 100 ml and mix. After 20 minutes, check at 475 mu. For steels containing 1 to 3 per cent nickel, use the same weight sample but dilute the final volume to 200 ml.

For high-nickel alloy steels (8 to 12 per cent) transfer 125 ml from the same diluted solution as used for the determination of chromium by the carbazide method. For nickel alloys above 12 per cent, use proportionately less. Transfer the solution to a 250-ml beaker containing 1 or 2 ml of zinc oxide solution (avoid an excess of zinc oxide solution) and mix. Dilute to 200 ml and allow the precipitate to settle. Decant 100 ml of the clear solution into a 500-ml volumetric flask containing 3 ml of tartaric acid solution. Finish as outlined above for nickel. Plot three standard curves for nickel, one each for the 100, 200, and 500 ml volumes.

MOLYBDENUM

For molybdenum contents of less than 0.35 per cent, transfer 20

Solutions Used in Making Analyses

Manganese Solutions

Silver Nitrate: 2.5 grams silver nitrate, 1500 ml water, 500 ml nitric acid.
Standard Sodium Arsenite: 36 grams sodium carbonate, 6.08 grams arsenic trioxide (As_2O_3), 1000 ml water (hot). Boil, cool, and dilute to 9000 ml with water. Standardize against a standard steel sample; adjust the volume so that 1.0 ml indicates 0.10 per cent manganese in a 0.2-gram sample.

Phosphorus Solutions

Sodium Sulfite: 100 grams sodium sulfite (anhydrous), 1000 ml water.
Ammonium Molybdate: 600 ml water, 300 ml sulfuric acid (conc). Cool the solution and add 20 grams ammonium molybdate. Dilute to 1000 ml.
Hydrazine Sulfate: 1.5 grams hydrazine sulfate, 1000 ml water.
Ammonium Molybdate-Hydrazine Sulfate: 25 ml ammonium molybdate solution, 10 ml hydrazine sulfate solution. Dilute to 100 ml in a volumetric flask. Prepare fresh solution every third or fourth day.

Chromium Solutions

Carbazide: 100 ml diphenyl carbazide, 50 ml alcohol, 150 ml water. Prepare fresh solution after three days.
Sulfuric-Phosphoric Acid: 1250 ml water, 500 ml sulfuric acid. Cool the solution and add 500 ml phosphoric acid.

Nickel Solutions

Zinc Oxide: 10 grams zinc oxide, 200 ml water. Mix well before using.
Tartaric Acid: 100 grams tartaric acid, 1000 ml water.
Dimethylglyoxime: 10 grams dimethylglyoxime, 1000 ml alcohol.
Sodium Hydroxide: 50 grams sodium hydroxide, 1000 ml water.

Molybdenum Solutions

Carbitol: 700 ml water, 750 ml carbitol, 50 ml perchloric acid.
Sodium Thiocyanate: 5 grams sodium thiocyanate, 200 ml water. Prepare fresh solution after several days.
Stannous Chloride: 700 grams stannous chloride, 500 ml hydrochloric acid (conc). Over heat, dissolve the stannous chloride in the acid. Then add 1000 ml water and 500 ml hydrochloric acid.

Copper Solutions

Citric Acid: 400 grams citric acid, 1000 ml water.
Sodium Diethyl Dithiocarbamate: 1.5 grams sodium diethyl dithiocarbamate, 1000 ml water. Keep solution in a brown bottle; prepare fresh solution after one month.

ml of master solution to a 100-ml volumetric flask containing 30 ml of butyl carbitol solution. Add 10 ml of sodium thiocyanate solution and 5 ml of stannous chloride solution, mixing the solution after each addition. Dilute with water and mix immediately. Let the solution stand for 20 minutes and check at a wave length of 470 mu.

If several determinations are being run at the same time, dilute only one or two of the solutions with water. The diluted solutions may become cloudy after standing 30 minutes or more. As a further precaution against cloudiness, butyl carbitol may be used in place of the butyl carbitol solution and the water used for dilution.

For steels containing a high molybdenum content use a proportionately smaller sample. For example, in testing a steel containing 2 to 3 per cent molybdenum, transfer 20 ml of master solution to a 100 ml volumetric flask, dilute, and mix. Transfer 10 ml of this solution to a 100-ml volumetric flask and finish as outlined above. Check at 470 mu and multiply the result by 10 to find per cent molybdenum.

COPPER

For copper contents of less than 0.15 per cent, transfer 20 ml of master solution into a 150-ml beaker. Add 20 ml of water and the following reagents, mixing after each addition: 10 ml of citric acid solution and 10 ml of ammonium hydroxide. If nickel content is more than 0.50 per cent, it should be separated out by adding 5 to 10 ml of dimethylglyoxime solution at this point. If the nickel has been precipitated, filter and wash with hot water catching the filtrate in a 150 ml beaker.

Cool the filtrate to room temperature, add 10 ml of sodium diethyl dithiocarbamate solution, and mix. Add exactly 50 ml of carbon tetrachloride and transfer to a separatory funnel, mix thoroughly by shaking vigorously, and allow the layers to separate. Mix and allow the layers to separate three times.

Transfer some of the solution from the bottom layer to an absorption tube after discarding the first 10 or 15 ml. Determine the copper content at 430 mu.

If the copper content is between 0.15 and 0.70 per cent, treat a 10 ml sample as outlined above. A standard curve at 500 mu must be plotted for this sample. For copper alloy steels higher than 0.70 per cent copper, use a proportionally smaller sample and apply a correction factor.

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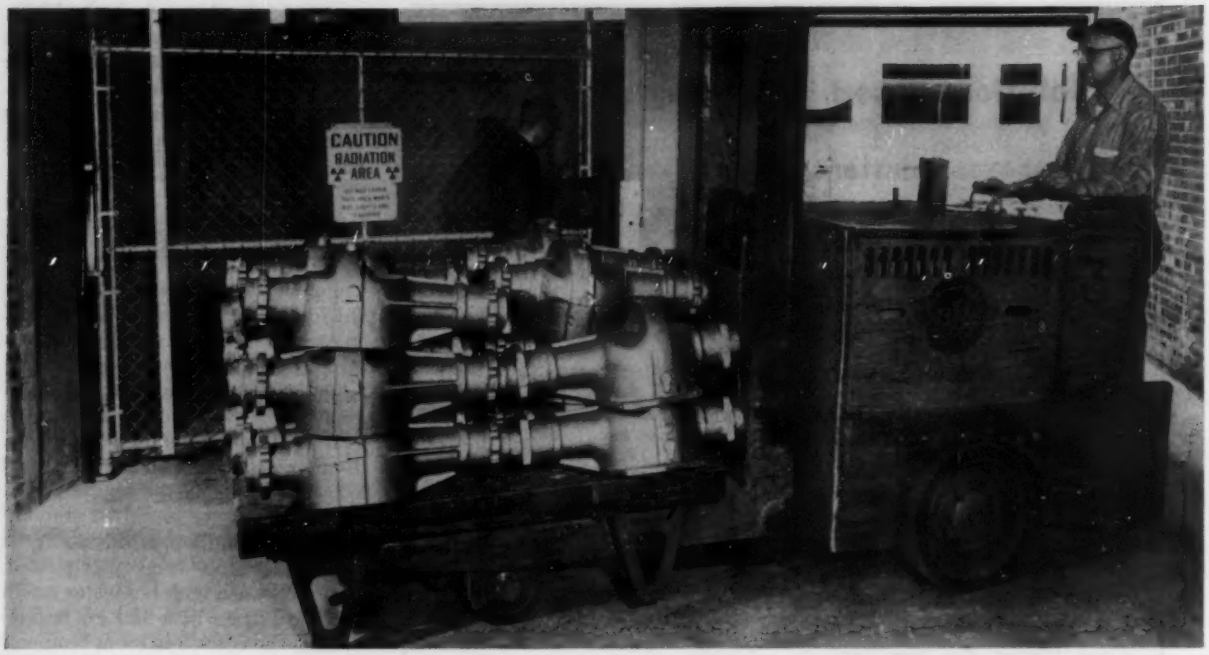

Castings are conveyed to and from the inspection room by lift truck. The gate automatically locks whenever the radiation source is outside its storage cabinet

Completes New Facilities for . . . RADIOGRAPHIC

● FARRELL-CHEEK Steel Co., Sandusky, Ohio, which currently is observing the 50th anniversary of its founding, has been one of the pioneers in industrial radiography of cast steel. Its latest step in this field was the completion of a gamma-radiographic inspection room to house a 5.25-curie source of cobalt 60.

The company's radiographic program was started in 1938 with a 500-milligram radium capsule as the source of energy. This equipment was supplemented in January, 1947, by the installation of a 250-kilovolt x-ray unit. Later, in March, 1951, a 500-millicurie capsule of cobalt 60 was purchased from Oak Ridge Laboratories of the Atomic Energy Commission.

The new building is adjacent to the x-ray facility. To prevent gamma radiation injury to personnel, walls 27 in. thick and 7½ ft high were required. A total of 320 cu yd of concrete was used in constructing the building, which is faced with brick. A sub-base, on solid clay, contains 53 cu yd of the concrete in order to support the walls. The interior has a floor space about 15½ ft square.

With the help of the Atomic Energy Commission, Farrell-Cheek has included the latest safety measures. All entrances, including those from outside, are equipped with flashing red lights operated by an alarm system. This system also locks all doors to the area by electrical controls as soon as the cobalt 60 source is exposed. Doors are automatically unlocked when the source is fully retracted into the storage chest. Even the roof is barricaded and guarded by flashing red lights. Approved AEC radiation warning signs are posted at all required locations.

Entrance to the gamma-ray room is by way of a concrete maze approximately 8 ft wide to permit access by electric truck for moving the castings to be tested. An electrically operated hoist with rails mounted on top of the walls is used to position heavier castings.

All personnel involved with the equipment are required to wear film badges. These badges are processed weekly. Pocket ionization chambers are checked daily. Records are kept of all exposure readings, and any employee who has received more than a government-specified level of radiation is removed immediately from further contact with the source.

Section thicknesses radiographed vary from a fraction of an inch to 6 in. or more. This range of penetration has made it possible to expose film through several castings or numerous sections of a single casting simultaneously.

Supplementing this radiographic equipment is the x-ray unit. Speed and accuracy are advantages of this unit, which is used to examine sections up to 2 in. thick. The combined facilities provide Farrell-Cheek with the means for maintaining the highest inspection standards.

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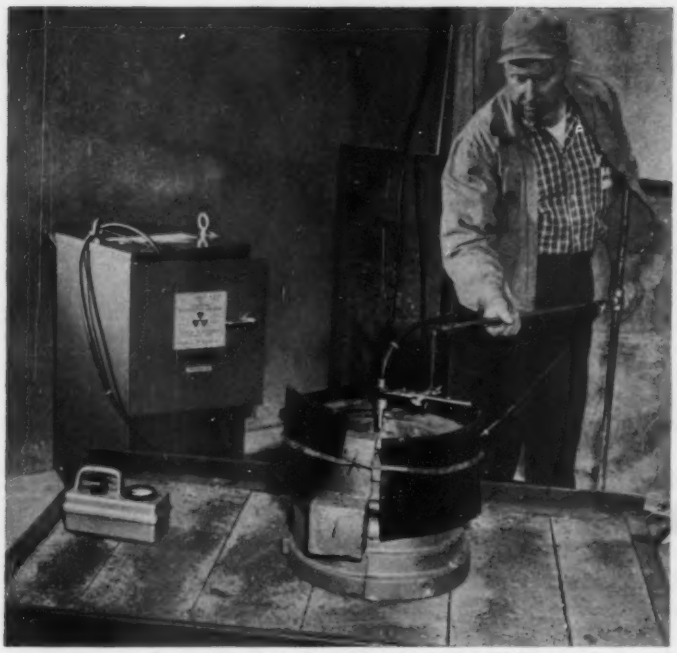
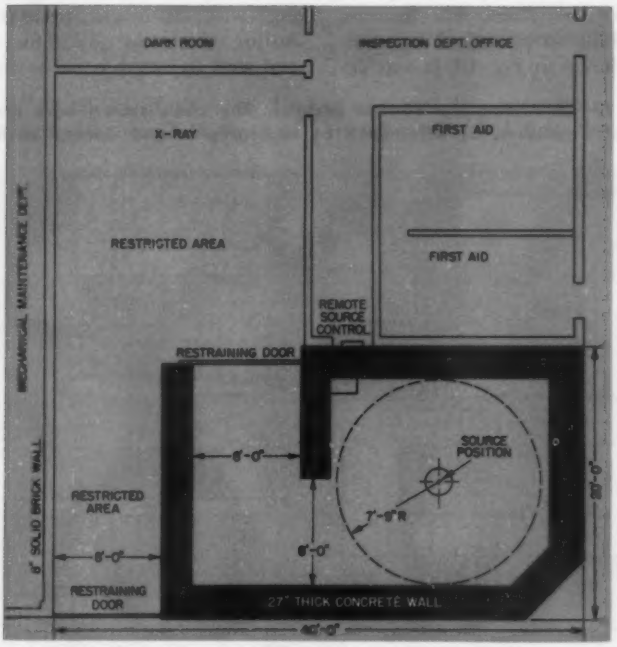


Positioning support tripod for a multiple exposure of a single casting. Survey meter nearby checks against abnormal radiation during preparations

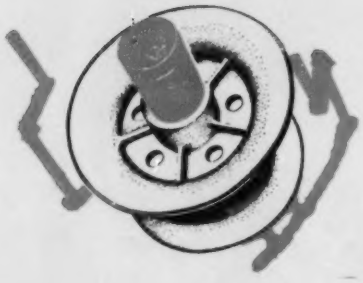
View of the gamma-ray inspection room showing castings arranged for a group exposure. Section thicknesses up to 6 in. can be radiographed

INSPECTION



Layout of radiography facilities in the new building. Windows for lighting are placed above the concrete portions of the walls, which are over 7 ft high

Exposures are made by remote control with instruments handled by a trained operator



By H. F. BISHOP
Director of Research
Exomet Inc., Conneaut, Ohio

RISERING
Of Steel Castings

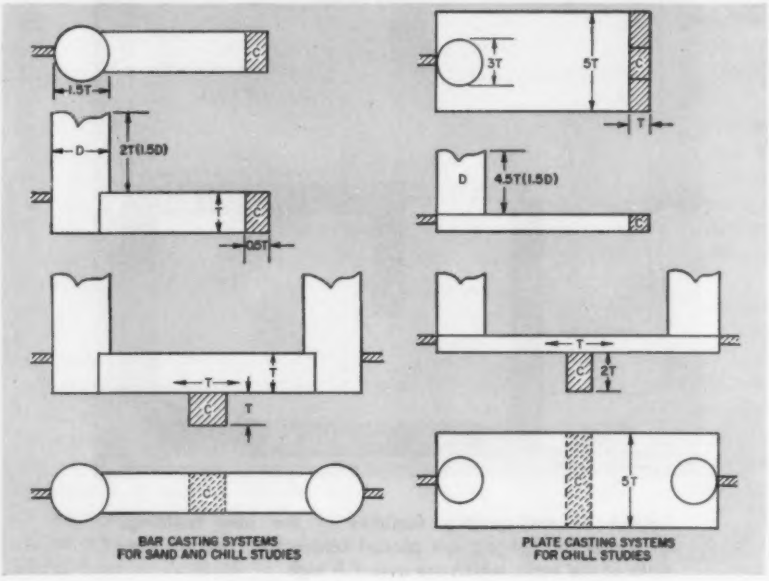
This article, second of three on risering of steel castings, explains how to calculate the proper size for a riser. Chills and the beneficial effects they have on feeding range also are discussed

● SINCE FEEDING RANGE in a casting is determined by the extent of the thermal gradients in the casting, any technique which accentuates the thermal gradient condition helps to extend feeding range. This end can be accomplished in two ways: 1. Accelerating solidification at the casting extremities. 2. Retarding solidification in the near-riser locations.

The application of chills to a casting frequently is employed to bring about more rapid freezing, and quantitative studies[4] have been made to determine their effect in promoting directional solidification. In this investigation, the chills used were designed to develop a continuing rapid rate of heat removal throughout the entire solidification period of the casting. This technique differs from the momentary and localized effects obtained by the conventional use of chills at hot spots, such as bosses, where the chill is required only to balance out the hot spot condition.

Plate and bar castings of different thicknesses were made with the riser at one end, but with the sand at the casting end opposite the riser replaced by a steel chill. Chill tests also were made on castings sufficiently long to require two risers. The chill was situated on the drag surface of the casting, midway between the two risers. The location of the chills on plate and bar castings is shown in Fig. 10. It was determined by both radiographic and thermal studies that for end chills a sufficient chill is one with the same cross-sectional area as the casting, with its length equal to the casting thickness (1T) for plates and with its length equal to one-half

Fig. 10—Chill locations on test castings. The chills shown here have proper dimensions as determined by radiographic and thermal studies



the casting thickness (½T) for bars. Chill lengths should be doubled when the chills are between risers.

Chilling the edge of plate castings increases the length of the sound end zone by approximately 2 in., regardless of the thickness of the plate. Chills at the end of bar castings increased the sound end zone by a distance equal to the thickness of the bar. These distances were relatively minor and indicate that the improvement obtained from such end chills does not, in most instances, warrant their use.

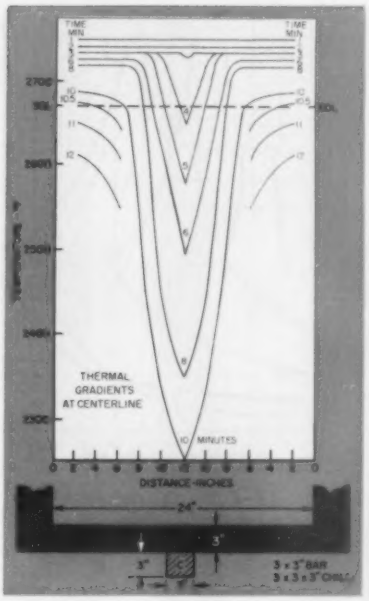
The thermal effect of the chill at the end of a simple section seems to be to cool further the already sound region at the end of the casting, rather than to extend thermal gradients much further into the casting. Thermal gradients are, however, extended into the casting for a distance corresponding to the increase in feeding distance obtained. The thermal curves show that the critical gradient conditions required for soundness were the same as those determined previously for unchilled castings.

Introduction of a chill at the midpoint of the casting, between two risers, has a marked effect in promoting directional solidification and increasing feeding range. Such a chill develops an artificial casting edge condition which, in effect, separates the long casting into two shorter castings. It creates soundness in each direction from the chill for a distance equal to that existing from the end of the casting.

As a result, two risers feeding toward each other can feed an unchilled plate 3 in. thick to complete soundness for a maximum distance of 12 in. (6 in. per riser), whereas a chill between them permits complete soundness when the risers are separated by 30 in. (15 in. per riser). Similarly, two risers on an unchilled 3 x 3 in. bar can be separated by only 10 in. (5 in. per riser) if shrinkage is to be avoided, but a chill midway between the risers permits this distance to be increased to 26 in., or 13 in. per riser.

Fig. 11 shows the thermal effect of a chill between two risers separated by 24 in. on a bar casting with a cross section of 3 x 3 in. An essentially isothermal region is changed by the chill into a region of steep gradients and strong directional solidification. It is fortunate that this marked effect is obtained in the case of multiple risers, which normally represent the most difficult condition of feeding.

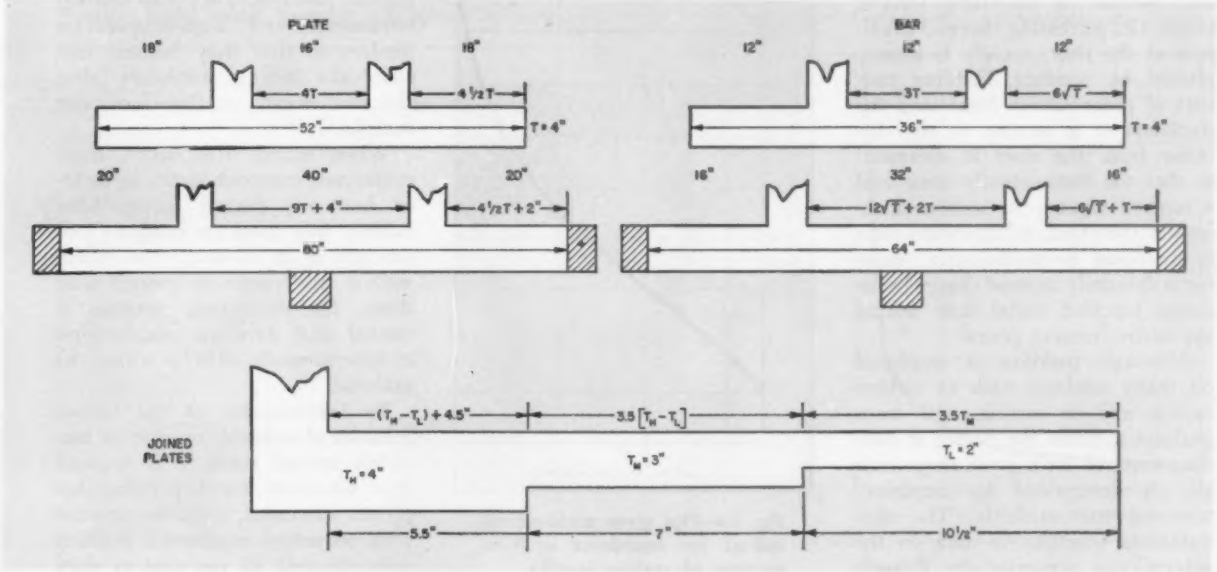
Fig. 11—The thermal effect of a chill placed between two risers on a 3-in. bar casting



The more extensive feeding distances which may be obtained result in an increase in casting yield since fewer risers are required to provide the necessary coverage. Fig. 12 summarizes feeding range for all the various combinations of plates and bars, both chilled and unchilled, presented heretofore. Also shown are numerical feeding distances for the section thicknesses indicated.

In connection with such applica-

Fig. 12—Effect of chills on feeding distances in plates, bars, and joined sections. Distances expressed in terms of T can be calculated from the sample values given



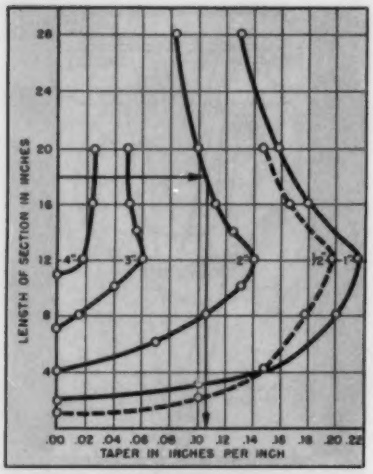


Fig. 13—Padding required to feed completely plates of various lengths and thicknesses

tion of chills, it should be pointed out that chills may lead to hot tearing in the immediate vicinity of the chill. To minimize this effect, chills should be coated with a refractory wash and should not be made too long. It is better to cover the chilled area with several small chills so that the small space between them will permit some contraction of the casting.

Another technique which has been proved to minimize the hot tearing effect is to place the chills in a staggered position rather than in a straight line.

Application of Padding—The second method of increasing feeding range, i.e., increasing thermal gradients at the riser, usually is accomplished by padding. Padding consists of progressively increasing the thickness of a section as the distance from the riser is decreased so that the riser actually must feed a tapered section. As section thickness is increased, solidification time is increased proportionately, causing a definitely tapered channel condition for feed metal flow during the entire freezing period.

Although padding is employed on many castings, such as turbine casings and on castings with long, uniform sections, the degree of padding required for a given shape usually is determined by empirical, trial-and-error methods. The only published quantitative data on the subject was presented by Brinson and Duma.[5] Fig. 13 and 14 summarize the important features of their studies.

Fig. 13 shows the padding in inches per inch needed to feed plate castings of various thicknesses and lengths to complete soundness. It will be noted that no padding is indicated for short lengths of the various sections where natural end effects provide directional solidification.

It is surprising to note from Brinson and Duma's work that the 12 to 14 in. heights require more padding in inches per inch than do plates of either shorter or greater lengths. They explain this anomaly by saying 1) that for castings under 12 in., strong end gradients aid in the establishment of the desired temperature gradient and, with it, the consequent prevention of bridging; and 2) that, for plates longer than 14 in., the increased ferrostatic head breaks through the bridging dendrites to aid the flow of metal. Fig. 14 shows the padding required on 1-in. sections of various lengths to make them completely sound. Fig. 15 illustrates the effectiveness of padding in eliminating center-line shrinkage.

It should be pointed out that Brinson and Duma did not determine the maximum length of uniform section which could be made completely sound. They started with overly long plates and systematically added padding until shrinkage disappeared. When they show in Fig. 13 and 14 the maximum lengths of plates which can be made sound without padding, they are referring to the end effects only. Their results are close to the $2\frac{1}{2}T$ values observed later in Naval Research Laboratory studies.

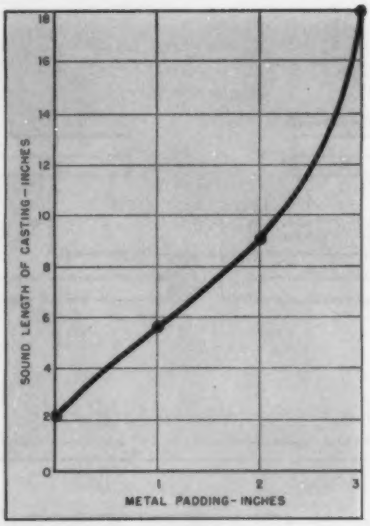


Fig. 14—Plot gives padding required for soundness in 1-in. sections of various lengths

Padding has a serious disadvantage, of course, in that it must be removed by scarfing or machining, which are expensive procedures. Thus padding should be employed only when other methods for feeding are not feasible.

A procedure of artificial padding with moldable exothermic materials offers great possibilities as a means of increasing feeding range in uniform sections. This procedure does not require the extra metal or the extensive cleaning problems characteristic of metal padding. There is, however, a lack of quantitative information pertaining to the use of exothermic materials as padding; as a result, this method is not used extensively. Its application currently is confined to those foundries willing to develop their own procedures for use on certain specific castings.

Moldable exothermic materials have been developed primarily for use as riser sleeves, and their use for this application will be discussed in detail later. The heat-producing ingredients in these materials are those necessary for the classic thermit reaction: Metal oxide and aluminum powders. They also contain refractories and high-temperature binders so that they become mechanically strong insulators after the exothermic reaction has been completed.

When mixed with water, these exothermic compounds can be molded into any desired shape. After baking, they have the hardness and strength of an oil sand core. When molten steel comes in contact with them, the exothermic reaction is started and develops temperatures of approximately 2950° F within the material.

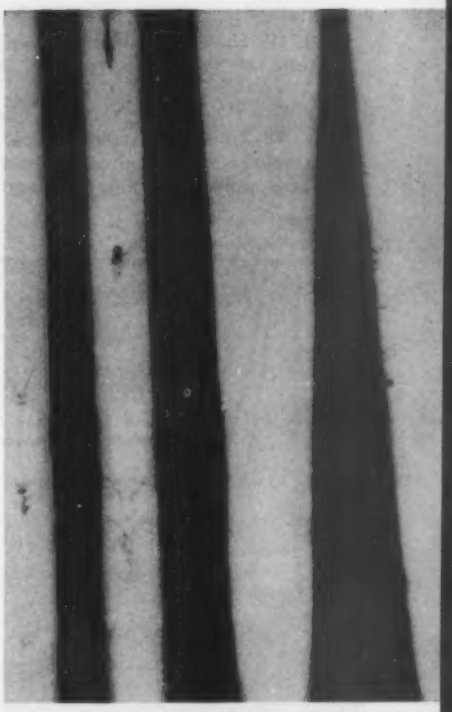
By interpolation of the known behavior of moldable exothermic materials around risers, it is deduced that wherever metal padding has proven successful, it can be replaced with refractory exothermic padding approximately 85 per cent as thick

as the metal padding. The effectiveness of moldable exothermic padding is illustrated in Fig. 16. This figure shows that a heavy section can be fed through a thinner section because the solidification time of the thin section has been delayed by the action of the exothermic pad adjacent to it.

Dimensioning of Risers — The quantitative determination of the correct riser dimensions required on a given casting has its basis in the work of Chvorinov,[6] who showed that the solidification time of a simple section was proportional to a relationship between the volume and surface area of the section, specifically, $ST = (V/SA/2.09)^2 \times 60$. This formula predicts that if the thickness of a given shape is doubled, its solidification time is increased fourfold. Thus the solidification time of a 2-in. plate section is about 13½ minutes, and the solidification time of a 4-in. plate is about 55 minutes.

This formula also predicts that a bar shape (one with circular or square cross section) which is twice as thick as a given plate section will solidify in the same time as the plate section. Thus both a long, 4-in. diam bar casting and a long, 2-in. plate casting will solidify in about 13½ minutes. Similarly, a 3T (6 x 6 x 6-in., for example) cube will solidify in the same time as a 1T (2-in. thick) plate. The accuracy of this formula for plate and cylindrical bar shapes has been verified by thermal analyses methods. For bar shapes of square cross section and for cubes, the thermal data indicate that the constant in the equation should be slightly reduced.

Fig. 15—Radiograph shows how padding eliminates center-line shrinkage in 1-in. sections



In average foundry practice, a riser is a cylinder with its end effects minimized to a great extent by the casting on one end and hot topping compound on the other. The riser freezing time thus is, for practical purposes, proportional to the square of its diameter. The practical significance of Chvorinov's findings is that a satisfactory riser cannot be made arbitrarily to have a diameter which is a certain multiple of the casting thickness, as often was done in the past. Rather, the casting shape on which the riser is situated must be considered. It has been found that the minimum riser diameter for plate, bar, and cube sections is 2.5T, 1.6T, and 1.1T respectively, where T is the thickness of the casting.

Caine[7] adapted Chvorinov's findings to a scientific method for the determination of riser sizes needed on various casting shapes. The chart which he developed is shown in Fig. 17.

This method requires that surface areas and volumes of the casting and arbitrarily selected risers must be determined. If the point obtained by his calculations is plotted on the co-ordinates indicated in Fig. 17 and falls to the right of the curve, the casting will be sound. If it falls to the left of the curve, the riser is inadequate and will not feed the casting.

If the riser is shown to be inadequate, a larger riser must be as-

Fig. 16—Heavy sections are fed completely when exothermic pads delay freezing of lighter sections

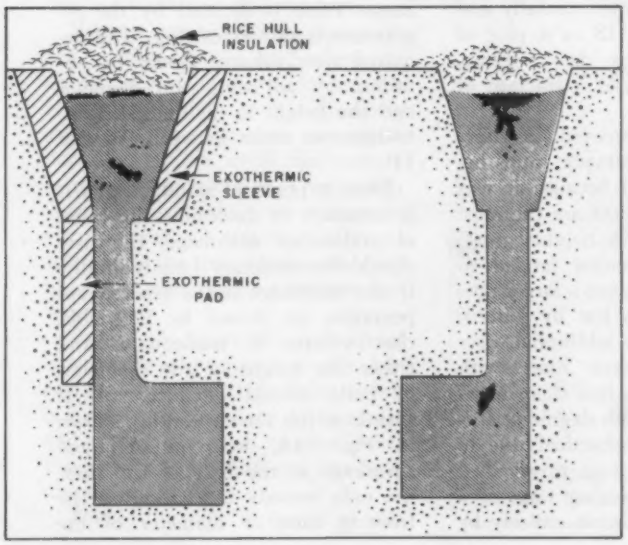


Fig. 17—Caine's chart for determining adequate riser volumes. Cut-and-try calculations are used

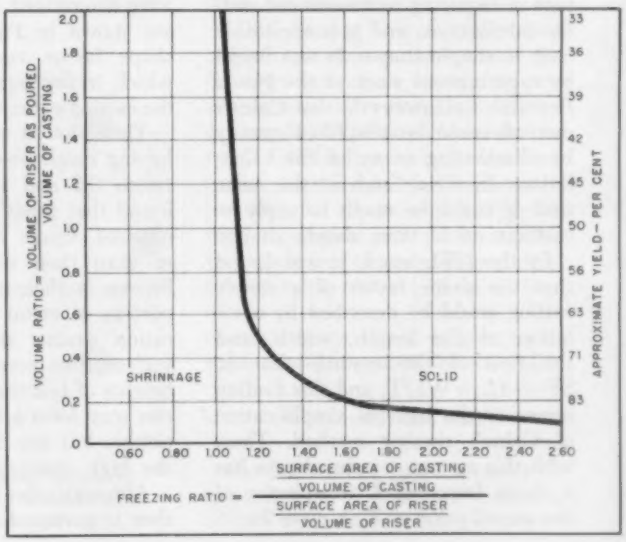


Fig. 19—Shrinkage patterns shown here are characteristic of these two types of inadequate risers

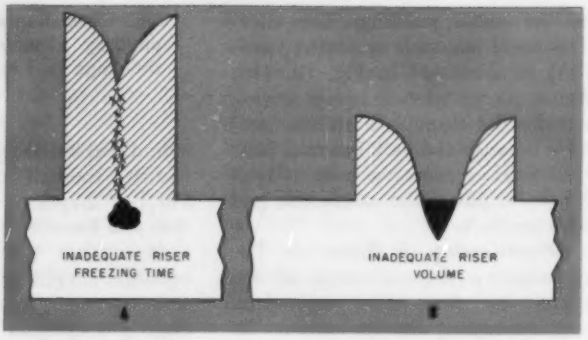
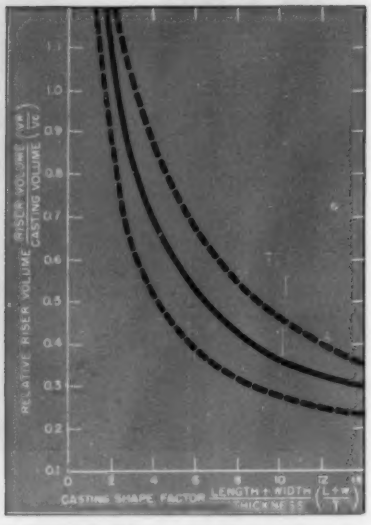


Fig. 18—Using the casting shape factor and casting volume, this graph will give the minimum riser volume within the range indicated by dashed lines



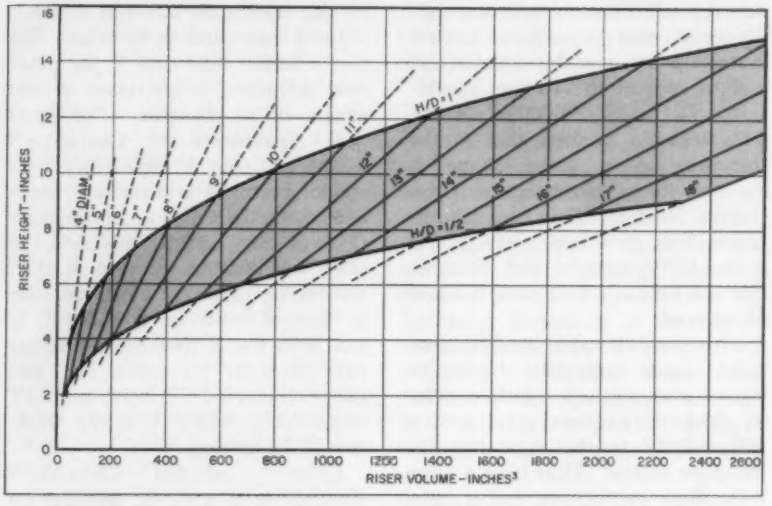


Fig. 20—Chart to convert required riser volumes to riser dimensions. All points within the band represent the most efficient riser shapes

sumed, such that the calculations will bring the plotted point to the right side of the curve. If the point falls too high in the sound region of the chart, it indicates an over-adequate riser, which will result in low yields. A smaller riser then must be selected arbitrarily and the calculations repeated to bring the point as low as possible on the chart while keeping it within the region of soundness.

Caine's method has the disadvantage of requiring numerous cut-and-try calculations, and it is applicable only to simple shapes. It was found by experimental work at the Naval Research Laboratory[8] that Caine's method could be simplified greatly by eliminating many of the calculations involved, and at the same time it could be made to apply to castings other than simple shapes.

In the NRL work, it was found that the shape factor of a simple casting could be described by a relation of the length, width, and thickness of the casting—that is, $SF = (L + W)/T$, and this finding serves as the basis of simplification of Caine's risering method. Thus, with this system, a cube always has a shape factor of 2, irrespective of the actual value of T. A plate 2 x 16 x 24 in. has a shape factor of (16 + 24)/2, or 20. A bar 4 x 4 x 16 in. has a shape factor of (4 + 16) /4, or 5, etc.

The minimum riser dimensions needed for a variety of simple shapes were determined experimentally and are shown in Fig. 18 as a plot of shape factor versus riser volume, which is expressed as a fraction of the casting volume.

This plot is restricted to risers having height-to-diameter ratios between 0.5 and 1.0 because it was found that these risers are the most efficient. Risers with heights greater than their diameter tended to become inefficient since a larger proportion of metal is lost by solidification against the additional riser surface thus presented. Risers with heights of less than half their diameter may have a high degree of efficiency, but are impractical due to the high cleaning costs involved.

Although the freezing time of a riser is governed almost entirely by its diameter, the volume can be adjusted by increasing either diameter or height. For a given casting, a certain minimum riser diameter is required, and whether or not the diameter is increased above this minimum value is dictated by the requirements of the casting. The required riser volume should be obtained by adjusting the diameter and the height to maintain height-to-diameter ratios between 0.5 and 1.0.

From a practical standpoint, if it is necessary to determine the cause of under-riser shrinkage, the riser should be sectioned longitudinally. If the shrinkage has a tapered appearance, as shown in Fig. 19B, riser volume is inadequate, and either the height or the diameter, or both, should be increased. If shrinkage has the appearance shown in Fig. 19A, with an enlarged shrinkage at the base of the riser, the only remedy is to increase the freezing time or diameter of the

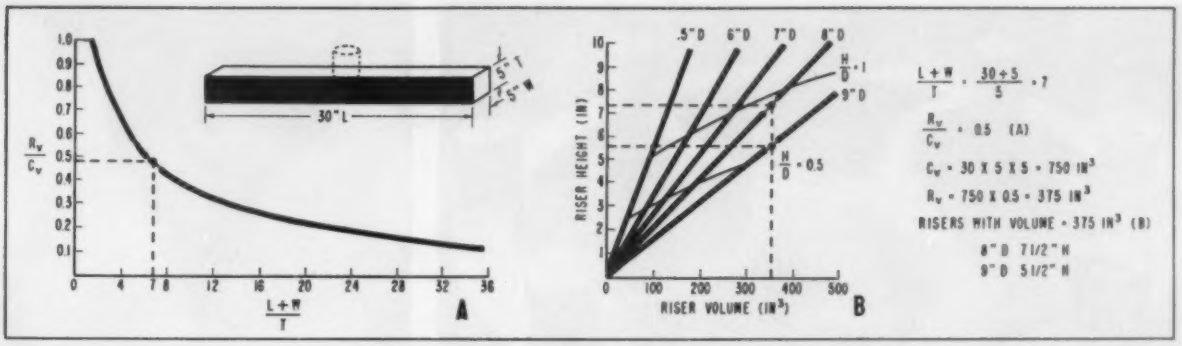


Fig. 21—Method of calculating riser size for a bar casting is shown here. Two riser sizes are adequate for this sample problem

riser. Increasing the height of such a riser will have little effect since, regardless of its height, it will freeze prior to the casting and will be unable to supply the last increment of liquid feed metal required by the casting.

Variations of the experimental points between the upper and lower bands in Fig. 18 result from variables not subject to exact control. To adapt this method of choosing risers to any particular foundry, it is recommended that risers first be chosen which correspond to the upper region of the band. Riser sizes subsequently can be reduced to the lower region of the band if it is found that the riser size is excessive.

To translate the riser volume determined in Fig. 18 into riser dimensions, the chart of Fig. 20 is used to interrelate riser height, riser diameter, and riser volume. The upper and lower curved lines of the chart connect representing riser heights equal to 1 and to ½ times the riser diameter respectively; hence, all points within the band represent the most efficient riser shapes.

When castings are risered according to this system, and risers are chosen according to this chart, the riser diameter always is sufficiently great to cause the riser to remain partially molten until the casting completes solidification. Thus, when properly used, the two charts in Fig. 18 and 20 automatically resolve both the time (minimum riser diameter) and the riser volume factors.

Fig. 21 illustrates the methods of choosing a riser for a simple bar casting. At the left top of this figure is reproduced the shape factor chart (which is represented as a midpoint line within the band) and the riser dimensioning chart.

The (L + W)/T factor of this casting is shown to be 7, which indicates that the riser volume must be ½ of the casting volume, or 375 cu in. The riser dimensioning chart shows that a riser either 8 in. in diam and 7½ in. high or 9 in. in diam and 5½ in. high should be used on this casting. For large castings requiring two or more risers, the correct riser dimensions can be determined by figuratively dividing the casting into segments, which are to be fed by each riser, and then following the same procedure for each segment as described for integrally risered castings.

Many times, when the casting shape is irregular, it will be necessary to make approximations in arriving at the (L + W)/T factor. Fig. 22, for example, shows a ring casting which was risered according to the principles described. The ring was approximately 200 in. in circumference and had the irregular cross section indicated. For purposes of calculating the shape factor, the cross-sectional dimensions were assumed to be 5 in. for width and 3 in. for thickness. Eight risers were used on this casting, and, because of feeding range requirements, chills were situated midway between adjacent risers. Thus each riser must feed a segment of the ring 25 in. long. The following calculations were made to determine the dimensions of each of the eight risers:

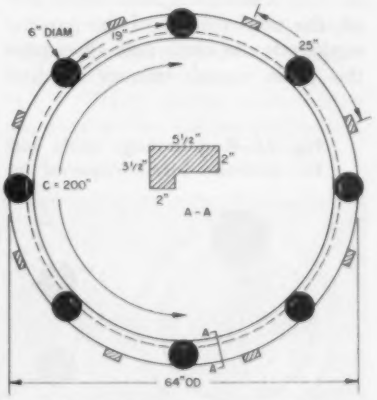


Fig. 22—Ring casting properly risered. Necessary calculations are outlined in the text

Cross-sectional area of the casting = 15 in.²

C_v per riser = 15 in.² x 25 in. = 375 in.³

(L + W)/T = (25 + 5)/3 = 10.0

R_v/C_v (from Fig. 18) = 0.45

R_v = 0.45 x 375 in.³ = 170 in.³

Riser having volume of 170 in.³ (from Fig. 20) = 6 in. in diam, 6 in. high.

The resultant casting poured with these risers was sound, and the x-ray of a slice removed from the center of one riser, Fig. 23, showed that the pipe extended to about ¾ in. from the casting.

This risering system will show only the minimum riser which can be employed on a casting to prevent under-riser shrinkage. If the casting is to be made sound, the rules for feeding range described earlier must be followed. Consider, for example, the casting in Fig. 24, with a circumference of 156 in. This was made free of under-riser shrinkage by using either 1, 3, or 6 risers of the dimensions indicated. The calculations employed in arriving at these riser dimensions follow:

A. Fed with one riser

Casting volume (approximate) = circumference x width x thickness = 156 x 12 x 4 = 7500 in.³

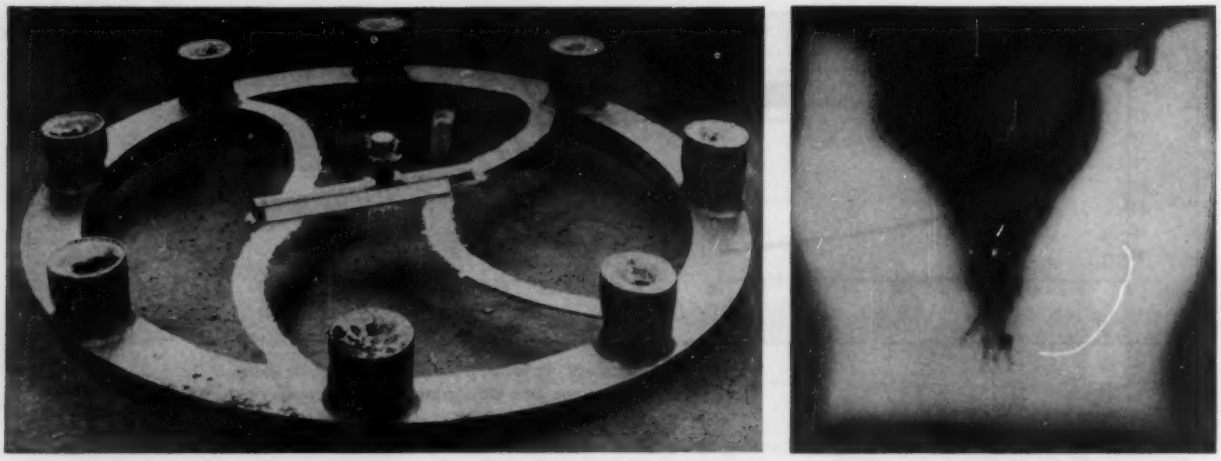


Fig. 23—The casting of Fig. 22 as removed from the mold. A radiograph, right, shows that the shrinkage pipe ends within the riser, an indication of adequate risering

$(L + W)/T = (156 + 12)/4 = 42$

R_v/C_v (from Fig. 18) = 0.12 (extrapolated)

$R_v = 0.12 \times 7500$ in.^{3} = 900 in.^{3}

Riser dimensions (from Fig. 20) = 12 in. in diam, 8 in. high

B. Fed with 6 risers

$(L + W)/T = (156/6 + 12)/4 = 9.5$

R_v/C_v (from Fig. 18) = 0.42

$R_v = (0.42 \times 7500$ in.$^3)/6 = 525$ in.^{3}

Riser dimensions (from Fig. 20) = 10 in. in diam, 7 in. high

C. Fed with 3 risers

$(L + W)/T = (156/3 + 12)/4 = 16$

$R_v/C_v = 0.27$

$R_v = 0.27 \times 7500$ in.$^3/3 = 675$ in.^{3}

Riser dimensions = 11 in. in diam, 7 in. high

The ring made with one riser, although free of under-riser shrinkage, contained extensive internal shrinkage since most of the casting is beyond the feeding range of the riser; however, if internal shrinkage can be tolerated, and only a good surface appearance is required, this method would be the simplest and most economical to make the casting since the riser volume required is only 12 per cent of the casting volume.

The other two castings were sound and illustrate the effectiveness of chills in increasing casting yield. The casting without chills required 6 risers, having a total of 42 per cent of the casting volume as poured, whereas the casting made with chills required only 3 risers, having a total volume of 27 per cent of the casting volume.

Risering Sections with Appendages—Most castings consist of several attached sections of different thicknesses and geometries, and in such instances, the riser is, of course, placed on the most massive section. The relative volume of riser metal needed for such castings is less than would be required for this same casting volume if it were distributed as a uniformly massive section.

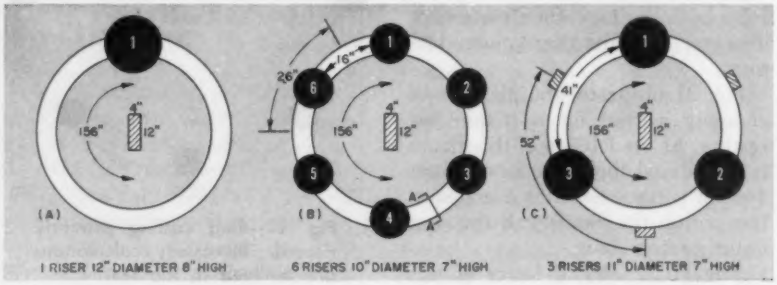
The reason for this is evident from the illustration in Fig. 25, which shows the solidification and feeding conditions in castings consisting of 4-in. thick plate sections to which are attached parasite plate sections of different thicknesses. For all, the total volume of the parasite sections is the same and all require the same actual amount of feed metal from their respective risers; however, the times at which the various sections demand feed metal are different.

The ½-in. sections become completely solid in about a minute and, therefore, require all of their feed metal by this time. Calculations show that at one minute after pouring, the 12-in. diam riser (initial volume of 113 cu in. for each inch of height) has solidified only to the extent that it has about 104 cu in. of liquid metal in the riser for each inch of its height.

The solidification times required for 1, 2, and 4-in. appendages are proportionately greater, and the volumes of liquid metal in the risers at the respective solidification times are approximately 95, 78, and 50 cu in. per inch, respectively.

Thus, where there is a high early feed demand, as for castings having thin appendages, the riser can supply a large volume of feed metal per inch of its height. When the appendages are thick, the riser must

Fig. 24—Ring castings made with different risering procedures, showing the minimum risers required in each case. See text for calculations



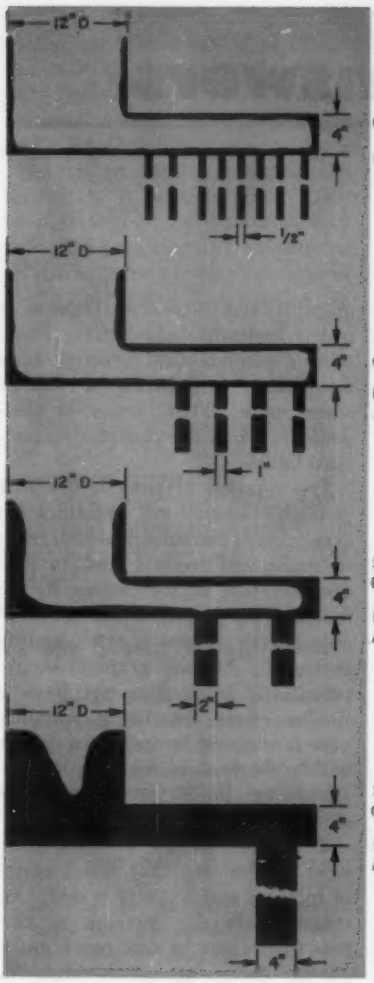


Fig. 25—Schematic illustration of how the time of high feed demand influences the riser efficiency

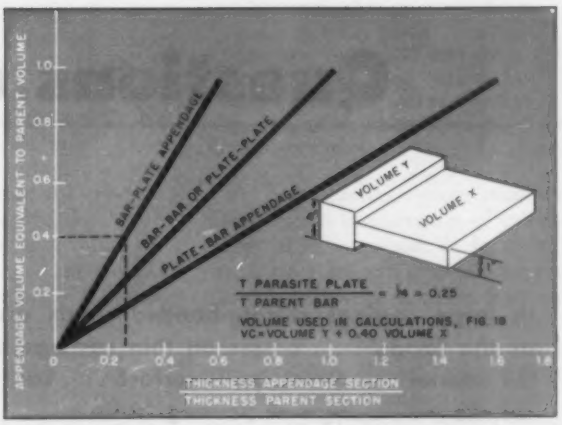


Fig. 27—Appendage riser requirements differ from those of parent casting sections. Equivalent volume of appendage must be found on this plot and added to parent volume to get total casting volume

supply feed metal not only to the appendages, but to the parent section as well at a late period in the solidification cycle, when it is least able to do so. Hence larger risers are necessary.

The timing of the feed demand is reflected in the shape of the riser pipe, Fig. 26, as sketched from actual risers on the castings indicated. With large early feed demands, the riser pipe tends to be wide and short, indicating high efficiency, whereas with large late feed demands it is narrow and deep.

Therefore, when the appendages are relatively small, the riser can be smaller in volume than would be required if the relative thicknesses of the appendages were great. Fig. 27 shows the fraction of the appendage volume which is equivalent to the volume in the parent section for purposes of calculating riser dimensions.

In this figure is shown a 4-in. thick parent bar with a 1-in. thick appendage plate attached, illustrating how the chart is used. The relative thickness of the parasite plate and the parent bar is equal to 0.25, which indicates on the horizontal axis that, for parent bar to appendage plate combinations, 40 per cent of the appendage plate must be considered as casting volume.

Regardless of the shape, thickness, and volume of the appendages attached to the parent plate, the (L + W)/T factor, from which the relative riser volume is obtained,

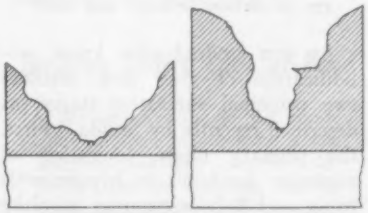


Fig. 26—Early feeding causes a shallow pipe (left) while late feeding results in a deep pipe

is determined only from the parent shape. Referring again to the example of Fig. 27, in translating relative riser volume to actual riser volume, the true volume of the parent shape plus 40 per cent of the volume of the appendage shape is multiplied by the R_V/C_V factor.

It can be noted from Fig. 27 that, when section differentials are great, the added riser volume needed to feed the appendages is very small. But as the section differential becomes smaller, the added riser volume increases proportionately. When the parent section and the appendage sections have the same solidification time, the entire appendage volume must, of course, be considered in determining riser volumes needed. Examples of how this risering system has been applied to relatively complex castings are described in Reference 9.

(To Be Concluded)

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Questions and Answers

In large castings silicate-bonded sands usually are used as the facing . . . Bosses on thin castings show shrinks in the interior . . . Dross spoils surface . . . Lack of feed causes shrinks . . . Design of pouring basin

CO_2 Sand for Heavy Castings

We are interested in the application of the CO_2 process to production of large, heavy-section castings. Type of sands, binders, additives, methods of gassing, sand wall thicknesses or any other pertinent foundry information would be helpful. Also we will appreciate a list of material suppliers.

Silicate-bonded sand usually is employed in the form of a facing backed up with green molding sand in the production of large castings. Facing thickness may vary from 1 to 3 in. depending on metal section thickness and the pattern, and probably will average about 3 in. In general, the sand employed is clay-free, and the grain size will depend on the surface smoothness desired. Sand with an AFS grain fineness of 70 to 85 serves well.

One suggested formulation for facing sand includes 300 lb silica sand with a grain fineness of 85, 1.5 per cent pitch compound containing 85 per cent pitch and 15 per cent dextrine, and 4.5 per cent proprietary silicate binder.

According to available information, the silicate facing sand at the mold face should have a hardness of at least 75 to obtain the most satisfactory surface finish, and that can be accomplished by hard ramming of the backing sand. Various phases of CO_2 mold and coremaking have been described in the literature; articles appearing in FOUNDRY include: "Making Ship Propellers with CO_2 Molds and Cores," February, 1957; "What You Should Understand About the CO_2 Process," June, 1957; "Molding with CO_2," October, 1957; "Developments in the Use of the Carbon Dioxide Process," March, 1959, and "Factors Affecting Sodium Silicate-Bonded Sands," April, 1959.

Sodium silicate binders and carbon dioxide are available from a number of suppliers whose names and addresses may be found in the advertising section.

Internal Shrink in Bosses

In our gray iron foundry in Argentina we are having trouble with shrinkage, particularly in some sewing machine bases weighing 8 kg. Shrinkage is in the bosses, generally in the central or heaviest one. Since we also produce thin castings on a production line we are obliged to use hypereutectic iron containing 3.10 to 3.60 per cent TC, and 3.10 to 3.00 per cent Si, resulting in a carbon equivalent of 4.40 to 4.55.

In various articles mention is made that hypereutectic irons have a tendency to shrink, but no information is given to prove this. What we would like to know is whether a hypereutectic composition can cause shrinkage in a casting. Can it be controlled, and how can kish graphite be observed under the microscope? Also can variations in cupola bed height produce shrinkage in certain castings, and why?

As you undoubtedly know, solidification of gray iron involves two principal successive stages, as described recently by Szajda. First, the primary phase consisting of austenite dendrites in hypoeutectic irons, and kish or primary graphite in hypereutectic irons, is precipitated over a range of temperature. Second, the eutectic consisting of graphite and austenite forms at a nearly constant temperature. Phosphorus extends the eutectic range downward, introducing a further stage some 200° C lower in temperature when the phosphide eutectic solidifies.

Precipitation of eutectic graphite generally causes net solidification expansion of the eutectic which tends to cause self feeding and to produce dilation of the casting in the mold. The greater the amount of eutectic the greater the self-feeding potential. Primary graphite in hypereutectic irons does not have a similar effect because it solidifies over a range of temperature during which thermal contraction of the remaining liquid produces a net shrinkage.

Investigations by a number of workers indicate that the amount of internal shrinkage or porosity increases with the increase in carbon equivalent in specimens molded in green sand, provided the phosphorus is above 0.25 per cent, according to Timmins. Szajda confirmed the relationship, but pointed out that the effect of carbon equivalent is contrary to that predicted from knowledge of the constitution and solidification sequences of gray iron. He suggested that the reason might be due to eutectic solidification expansion enlarging the casting instead of causing self feeding when green sand molding is used. That is, mold rigidity may be an important factor.

From the foregoing it appears that internal porosity might be controlled by reducing the phosphorus content to a low value. Indications are that phosphorus up to about 0.2 per cent is present in solution in the ferrite, and at some point slightly above that the phosphide appears as a separate phase. Probably more important is to see that the mold hardness is such that no mold wall movement occurs during the precipitation of eutectic

graphite. Possibly holding the iron in the ladle for a period of time to decrease the number of eutectic cells formed might help. Pouring temperatures on the low side also might be of value.

As far as kish graphite is concerned, it is doubtful that it can be observed in the section sizes involved. Essentially it is an extremely coarse form of graphite appearing in clusters. Etching the polished specimen with 4 per cent picral should reveal the structure, including the various types of graphite.

With reference to variations in bed height, they usually result in changes in composition as well as in temperature, and it is possible that the shrinkage characteristics also may change due to those effects.

Casting Shows Surface Flaws

We are forwarding a section of an aluminum alloy casting containing a number of defective areas. This casting is made of alloy No. 356 poured at 1400° F. Sand used is natural-bonded of approximately 123 AFS grain fineness. The defect often occurs with other aluminum alloys also, and we are inclined to attribute the trouble to the mold rather than the metal although we have not determined this to be the case. Can you offer any suggestions on procedure to overcome this type of defect?

Examination of the section of the casting indicates that the small defects or spots result from dross which may occur from any of several causes. Most obvious, of course, is some carelessness in skimming, or in strong stirring before skimming.

The latter practice, intended to bring any dirt, oxides, etc., to the surface, often defeats the purpose. Since those materials have almost the same density as aluminum and rise rather slowly, a little time should be allowed for them to coalesce and for the separation to occur. If the molten metal is stirred violently, the dross and oxides tend to be divided into small particles which rise more slowly than larger particles.

If you feel that the metal must be stirred, do it gently with a slow pumping motion from the bottom upward without disturbing the skin on top of the pot. Wait for a few minutes and then skim. In skimming, the same precaution should be observed. Do it lightly with the least disturbance of the skin.

Drossing may result from improper pouring in that the crucible is held too high above the sprue opening; the result is greater exposure than necessary of the molten stream to the atmosphere as well as turbulence in the stream. A gating system which permits the metal to spurt into the cavity or impinge on cores or mold parts will result in turbulence and formation of dross and inclusions.

Many producers of aluminum castings find that use of rectangular sprues and runners in the drag and with the gates in the cope aid considerably in making quality castings. Also, extension of the runner for an inch or so beyond the last gate acts as a trap to catch any extraneous material and prevent it from entering through the gates into the mold cavity.

Casting surface contains defects

Bushing Shows Lack of Feed

We are using the 88-10-2 bronze alloy for some of our castings and bushings and only encounter difficulty with the bushings. Trouble shows up with cored bushings where the metal around the core is filled with small holes resembling shrinkage, as shown by the accompanying section of one of the larger bushings. When we add 2 to 3 per cent zinc, the trouble does not occur. We have tried various core mixtures and core washes as well as pouring at various temperatures, all without success.

In our opinion, your problem arises from a combination of causes rather than one and is indicated in the structure exhibited after fracturing the specimen. The fracture is somewhat feathery, with numerous multicolored patches ranging from tan to yellowish and with a few gray areas. Under a low-power magnifying glass, the patchy areas appear as rough surfaced holes showing a dendritic or pine-tree structure. These areas are indicative of shrinkage due to lack of feeding of the casting.

Fracture also shows some small holes which might be from gassy metal, and your statement that zinc minimized that condition confirms its presence. Zinc volatilizes at about 1760° F and usually is quite effective as a degasifier due to the boiling action. Possibly your pouring temperature may be somewhat high. The 88-10-2 alloy is said to be sensitive to temperature, and indications are that it should be poured around 2140° F.

You do not mention the gating system for the bushings. We suggest pouring in the vertical position, using a ring basin with pop or pencil gates. Extend the length of the cavity about an inch or so beyond the present length either by making the pattern longer or drawing it up during molding, to form a feeding head. The core also will have to be made longer. Four ¼-in. diam holes spaced equidistantly and located midway between the inner and outer peripheries should serve.

Basin Controls Metal Stream

We will appreciate receiving technical information on the siphon casting procedure shown in the accompanying sketch. We would like to know if there are any standards for this procedure in your country, and if so what they are.

Your sketch represents what is called a pouring basin in this country, and so far as we are aware there are no standard designs. Ruddle, in his book, *The Running and*

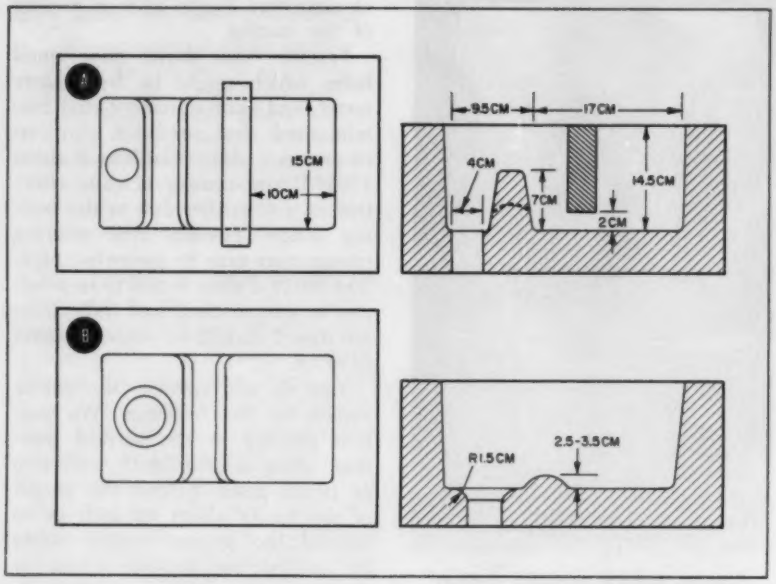
Gating of Sand Castings, points out that pouring basins should conform to the following principles:

1. The basin should be large enough to permit easy control of the pouring stream. 2. The basin should be deep enough to enable the metal level to be held at a height sufficient to prevent vortex formation. 3. The length and breadth of the basin should be at the minimum consistent with 1. 4. The orifice should be well radiused, the radius blending with the sprue. 5. The metal should be poured steadily, the lip of the pot being kept as close as possible to the basin.

Pouring basins may be used for two purposes. One common application is where location of the down sprue of the mold requires that the ladle lip be high above the mold to permit pouring, thereby causing turbulence and air entrainment in the stream. Use of a pouring basin extending nearly to the mold edge enables the ladle lip to be held low and provides smooth pouring. The other application which is receiving considerable attention is control of the metal stream so that vortexing and air entrainment are eliminated or held to a minimum.

Presumably your basin design is made with that in mind, but we believe that air entrainment will occur at least in the early stages due to metal cascading over the high hump close to the sprue opening. That condition could be minimized by reducing the height to about 3 cm or just slightly above the height of the opening under the barrier or bridge at the left, as indicated by the dotted line in the top sketch. Also the top of the sprue should have a good radius.

Your design appears somewhat difficult and expensive to make, and we suggest trying the simpler arrangement shown at the bottom of the accompanying sketch. The over-all dimensions are the same as you have indicated in your sketch. The relatively shallow well will permit buildup of a volume of metal covering the whole area before flowing over the dam into the radiused opening of the sprue.



Suggested simple design for two pouring basin

Producing Cylinder Liners

We operate a foundry in South America and produce centrifugally cast liners for automotive use. We have had some trouble in that we have had complaints that they are too soft and wear too rapidly. We use gray iron, and after casting the liners are heated to 800° C and allowed to cool in the furnace. Can you give us any suggestions relative to compositions, use of Cr and Ni, heat treating technique, and also on possible use of considerable steel scrap in the cupola charges? Such scrap is cheap here.

As might be expected, cylinder liners in this country are produced from a wide range of compositions, and they usually contain one or more alloying agents such as Ni, Cr, Mo, Cu, etc. One analysis shows 2.00 to 2.20 per cent Si, 3.0 to 3.2 per cent TC, 0.2 to 0.4 per cent each of Cr and Ni, and 0.4 to 0.6 per cent Mo. Another is given as 1.90 to 2.10 per cent Si, 3.2 to 3.4 per cent TC, 0.55 to 0.75 per cent Cr, and 1.80 to 2.2 per cent Ni.

Some of the liners are heat treated, and others are not. One foundry uses a composition containing 2.90 to 3.5 per cent TC, 1.80 to 2.5 per cent Si, 0.50 to 0.80 per cent Mn, 0.10 to 0.30 per cent P, 0.20 to 0.80 per cent Cr, and 0.25 to 1.0 per cent Ni or Cu. This plant does not use any heat treatment and makes liners with a Brinell hardness from 212 to 293. Production of a satisfactory product is accomplished by close control. Iron from the furnace comes out at 2800° F, and is poured at 2600° F. Liners are removed from the mold at 1600 to 1800° and allowed to air cool. Previous to pouring the metal, molds are sprayed with a coating of silica flour and bentonite.

One procedure for heat treating liners is to anneal at 1000 to 1100° for machining. Then they are heat treated at 1540 to 1560° for 30 to 40 minutes (⅜-in. section). After a quench in still oil, hardness of the castings will be over 500 Brinell. Drawing or tempering is in the range 350 to 370° for two hours, and the structure usually is finely martensitic with good wear resistance.

You undoubtedly are aware that the foregoing values are only tentative and will have to be determined experimentally for your foundry conditions such as composition, pouring temperature, thickness of mold coating, temperature of the liner when removed from the mold, etc.

We can see no reason why you cannot use considerable amounts of steel scrap in your cupola charges provided that additions of ferrosilicon or silvery pig are made to bring the silicon level to the desired point. Addition of ferromanganese also may be required. Again, some experimental work will have to be done to establish a satisfactory product.

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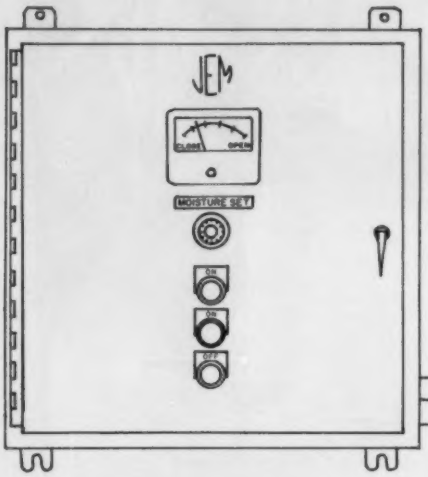

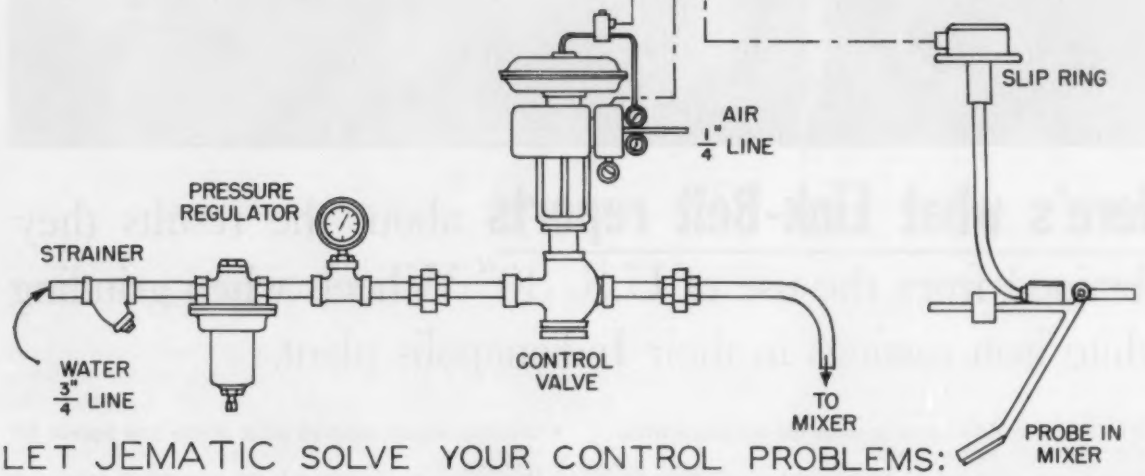

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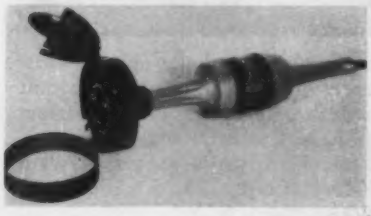
What's New in Equipment and Supplies

RUBBER GRINDING WHEEL

Solid rubber grinding wheel is offered for use with coated abrasive belt on company's line of 6-in. straight air grinders. Known as Mermac, the wheel fits directly on the spindle of the grinder. Abrasive belts in desired grits are slipped over



the wheel. Centrifugal expansion of the rubber wheel holds the belts positively without mechanical locking devices.

Advantages claimed for the wheel include quick changing of belts, continuous balance, and fine finishing because the resilient wheel is said to hug the work. Also, the abrasive bands are self-cleaning.—**Thor Power Tool Co.**, 175 N. State St., Aurora, Ill.

For More Details Circle No. 451—Page 55

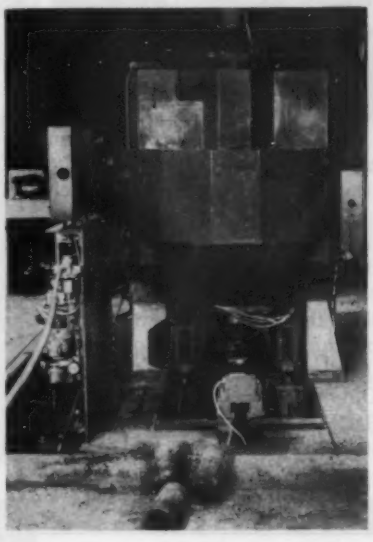
BIN LEVEL INDICATOR

Bin-Vue level indicator is mounted at top-center of the bin and is designed to give accurate level control even when there is a funnel of static material. Unit's 0.01 hp motor turns a four-blade paddle with a torsion spring as long as no material touches it. If material makes contact with the paddle, it stops while the motor continues to run. The spring is expanded until it actuates a limit switch which turns off the motor and any other equipment controlled by the unit. When the materials fall away from the paddle, the torsion spring reactivates the paddle and unwinds from the limit switch, starting the motor and putting the unit in operation again.—**Convair**, Pittsburgh 26, Pa.

For More Details Circle No. 452—Page 55

CENTRIFUGAL CASTING

Centrifugal casting system incorporating an automatic pouring-spinning machine is said to produce comparatively thin-walled castings containing minimum trapped air or gas. Molten ferrous or nonferrous metal of an amount to produce the desired casting wall thickness is poured into a crucible. The machine automatically positions the crucible under the die and locks the two together. They are spun at a controlled speed, and because they are



in a vertical plane, the molten metal starts to climb up the walls of the die, creating a vortex. Just before the metal solidifies the spinning die and crucible are turned to a horizontal axis to insure that all the metal enters the die. The machine automatically ejects the casting. Production rate depends on size and weight of casting, but estimates indicate 60, 10-lb castings an hour. —**F. E. (North America) Ltd.**, 47 Advance Rd., Toronto 18, Canada.

For More Details Circle No. 453—Page 55

HEAVY DUTY SHAKEOUT

Heavy duty shakeouts are equipped with vibrator mechanisms which permit construction of shakeouts up to 18 x 20 ft and 150 tons capacity. These larger units are said

to reduce the amount of mechanical and drive components to be maintained and eliminate most of the operating problems of multiple units. —**Hewitt-Robins Inc.**, Stamford, Conn.

For More Details Circle No. 454—Page 55

AIR-COOLED MOTOR

Tube-cooled motor has an air to air heat exchanger for a cooling system. Unit is produced in sizes up to 2000 hp and is available in explosionproof construction for use

in hazardous locations. In addition to the cooling system, features include corrosion-resistant construction, capsule-type split sleeve bearings, and pressure lubricating systems with oil level indicators.—**Louis Allis Co.**, Dept. P, Milwaukee 1, Wis.

For More Details Circle No. 455—Page 55

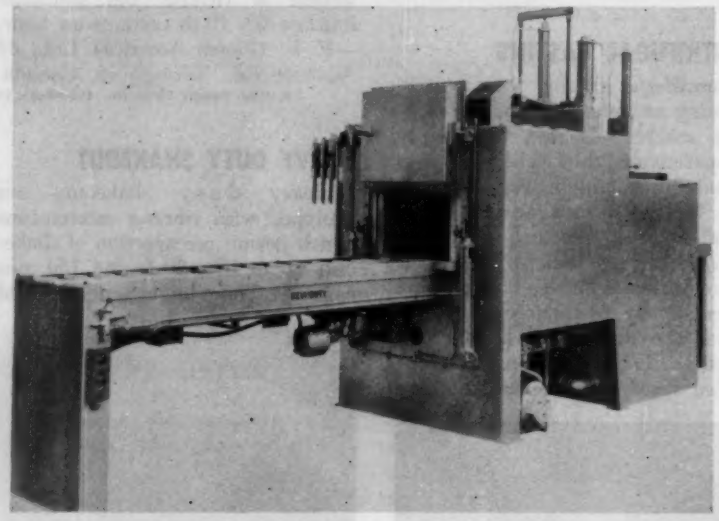
AIR VALVE

Valve is designed to increase safety during repair, maintenance, and shutdown periods on machines using compressed air power. Lockout and exhaust valve is installed in the air supply line leading to the machine, upstream of any operating valve, and normally the air flows right through it. When unit is shifted, air to the machine is shut off, and the air downstream

is exhausted to the atmosphere. Made in four sizes for 3/8 to 1-in. pipe, valve is designed for minimum pressure drop and can be padlocked in the closed position.—**Ross Operating Valve Co.**, 120 E. Golden Gate Ave., Detroit 3, Mich.

For More Details Circle No. 456—Page 55

Heat Treat Furnace Is Fully Automatic



Clean-Line automatic heat treat furnace was developed for use in bright hardening, carburizing, carbonitriding, annealing, and normalizing operations. Unit is completely automatic from loading through quenching. A pusher arm on the loading table directs work baskets into the heating chamber. With cycle timers and controls set, the load is brought up to the correct temperature and maintained at that level for the prescribed time.

After treatment, a transfer arm moves the work basket from the heating chamber into the quench chamber. The work is submerged in oil that is constantly cooled by pumping through a heat exchanger. After a predetermined time the work is raised to drain position, ready for removal from the heat treating unit. — **Hevi-Duty Electric Co.**, a division of Basic Products Corp., Milwaukee 1, Wis.

For More Details Circle No. 492—Page 55

DYE-PENETRANT INSPECTION

Dye-penetrant inspection system known as PIXchek is for detecting surface flaws in a variety of industrial materials. A kit of equipment for on-the-spot inspection includes cans of dye inspection materials. The materials also are available in bulk quantities for installations on production lines. Unseen flaws are made visible by the action of a

chalk-white developer on a low-viscosity red dye. The dye-penetrant is drawn up by the developer from the defect to make a red stain pattern on a white surface.—**Picker X-Ray Corp.**, 25 S. Broadway, White Plains, N. Y.

For More Details Circle No. 457—Page 55

ROOF COATING

Roof coating combines rubber and aluminum and is said to extend the life of asphalt roofs as much as 15 yr. Material is applied with an ordinary paint roller, even over shingle roofs. It is claimed to improve the old roof's ability to reflect heat by 15%, provide a waterproof coating, and not to chip, crack, or peel. Available in four colors, the coating is fade resistant. —**United States Rubber Co.**, 1230 Avenue of the Americas, New York 20, N. Y.

For More Details Circle No. 458—Page 55

METAL PRIMER

Clo-flex 621 metal primer utilizes a unique molecular hydrocarbon structure which is compatible with practically all finish coatings. Suitable for primer uses on most metals, it dries to a tackfree finish in 15 minutes under average conditions.

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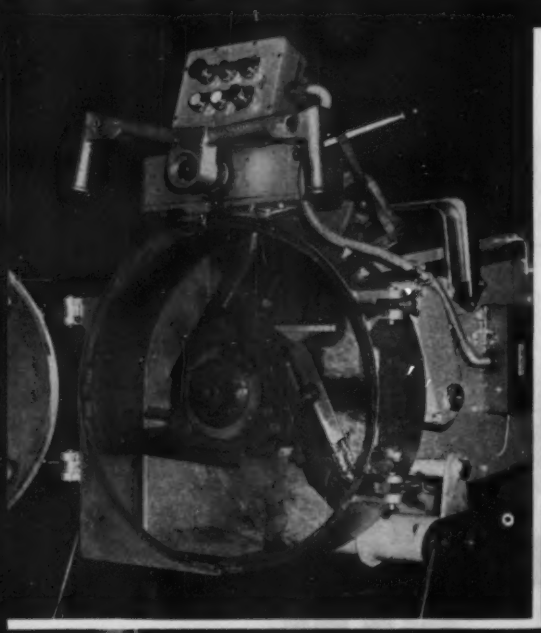

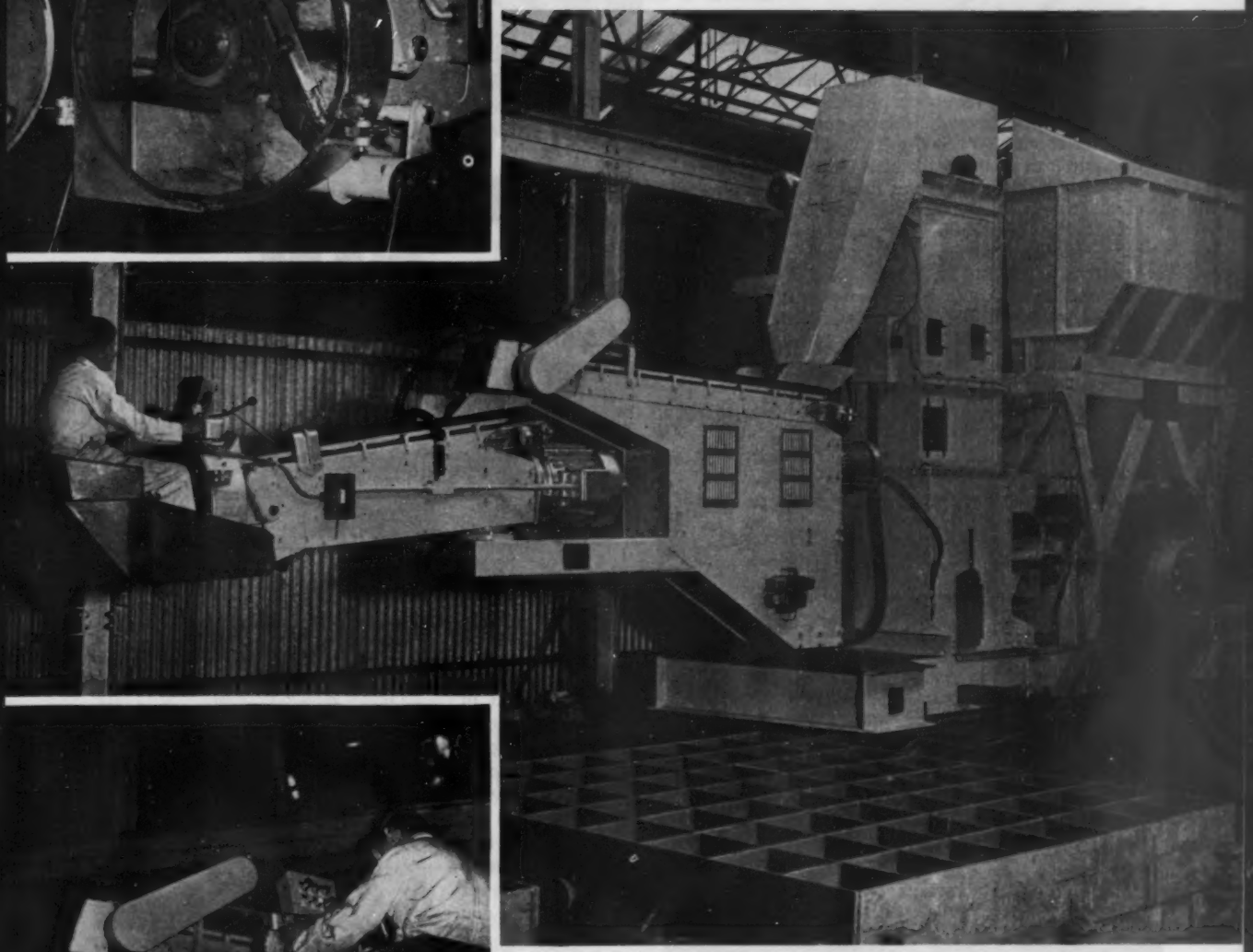

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Circle 625 on Page 55

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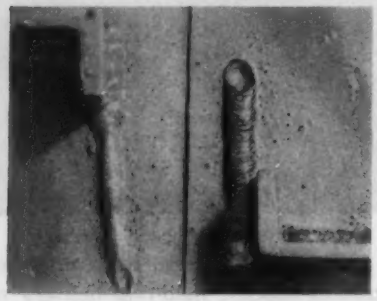
Circle 626 on Page 55

It can be force dried in 3 to 5 minutes.

Primer can be applied with only one spray, paint, or dip exposure and give complete coverage of all



metal surfaces. Photo compares new material (left) and ordinary primer. —**Harrington Paint Co.**, 1642 Collamer Ave., East Cleveland 10, Ohio.

For More Details Circle No. 459—Page 55

POWER CYLINDER MOUNT

Power cylinder mounting consists of a flange plate ground to accurate thickness and extending beyond the mounting-side surface of the cylinder. To mount the cylinder, the flange is fitted into a slot milled into the machine's mounting surface; the unit then is locked in position with the standard mounting provided. The machining of the milled slot is said to simplify positioning and permit the cylinder to be mounted quickly and accurately. Unit is available in side lug, flush side, and end lug mounting styles.—**Miller Fluid Power Div., Flick-Reedy Corp.**, York and Thorndale Roads, Bensenville, Ill.

For More Details Circle No. 460—Page 55

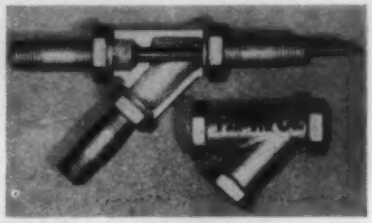
AIR SAMPLER

Bantam Sampler weighs 9 lb and samples air at the rate of 2 cfm. Unit consists of a centrifugal carbon vane pump, motor, cooling fan, protective case, and flowmeter. Designed for use during an eight-hour day, sampler can be operated continuously for longer periods. Voltage requirements are 110 v ac, or 6, 12, and 24 v dc.—**Gelman Instrument Co.**, 106 North Main St., Chelsea, Mich.

For More Details Circle No. 461—Page 55

DIE COOLING FITTING

Single return water line fitting Y-250 is designed to be used in cooling die-casting dies or cores.

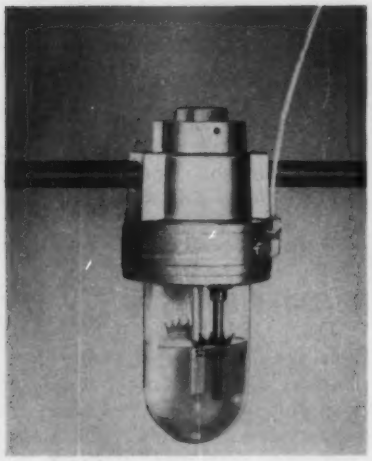


Only one hole is necessary to install this fitting so it will direct water into an area of the die which is running too hot.—**Par-Vin Co.**, 29 Union St., Batavia, N. Y.

For More Details Circle No. 462—Page 55

LUBRICATION DEVICE

Crown Pulse lubricator for air-operated devices is said to deliver exactly the required amount of oil to the spot where lubrication is needed. The system operates on pressure variations and is entirely independent of air flow rates and duration of flow periods. The outlet



end of the oil delivery line can be placed in any position without an auxiliary pressurized oil supply.—**Hannifin Co.**, a division of Parker-Hannifin Corp., Dept. 238, Des Plaines, Ill.

For More Details Circle No. 463—Page 55

THERMOCOUPLES

Xactpak alloy-sheathed thermocouples are made from all common alloys and insulations, including high temperature materials. They can be obtained as single or multi-pair wire or as complete assemblies with plugs, fittings, waterproof heads, and a variety of hot and cold end terminations.—**Claud S. Gordon Co.**, 3000 South Wallace St., Chicago 16, Ill.

For More Details Circle No. 464—Page 55

SLING HOOK

Tyco sling hook No. A-75 is offered for use with 1¼ and 1⅜ in. diam alloy chain. Features include a large eye and wide, deep throat with an I-beam cross-section to provide extra strength. Hook is drop-forged from alloy steel and heat treated.—**S. G. Taylor Chain Co.**, Hammond, Ind.

For More Details Circle No. 465—Page 55

ULTRASONIC TESTER

Circosonic ultrasonic materials tester shown is portable Model CM100, which can be used for surface or internal flaw detection, thickness measurement, and determination of physical and structural properties. Any common plant

power supply can be used for the tester.—**Circo Ultrasonic Corp.**, 51 Terminal Ave., Clark, N. J.

For More Details Circle No. 466—Page 55

DISC SANDER

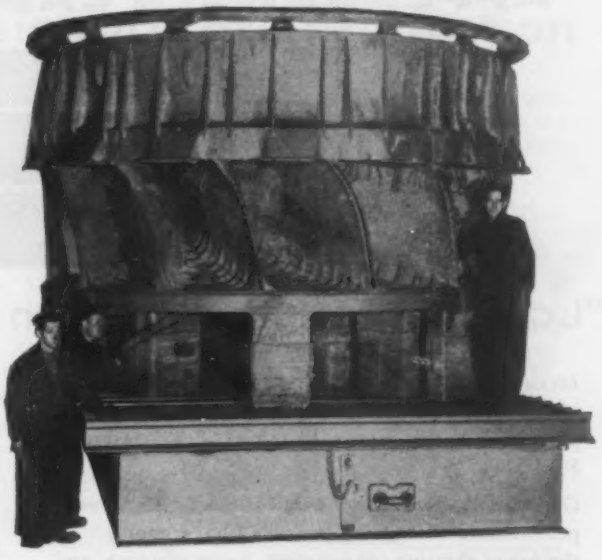
Tilt-disc sander allows the use of a stationary work table by using a tilting disc assembly made up of the direct motor drive, 14-in. sanding disc, and safety guard. It is claimed that heavy work pieces are easier to hold in position on the stationary work table which measures 20¾ in. wide by 9½ in. in front of the disc. A feature is the wrap-around area extending 3 in. to each side and 5⅛ by 3⅝ in. behind the disc. Adjustment of 15

EXECUTIVE REPORT #21

THEY SAID "IT COULDN'T BE DONE"

but Wheelabrator® cleaned this 100-ton casting in 20 minutes

The enormity of a casting like this would have made it one of those "impossible" cleaning jobs by manual airblasting. But a Wheelabrator Car-Type Room equipped with 8 blasting wheels takes it in stride at Canadian Steel Foundries, Ltd. Here, castings measuring 20 ft. in diameter and over 12 ft. in height are cleaned thoroughly in blast cycles of only 15 to 20 minutes in the automated Wheelabrator room.



Wheelabrator engineers, leading in experience in designing machines for special applications, have developed a line of blast rooms employing unique work-handling methods suited to varied requirements. For illustrated examples, ask for Catalog 142-D. Wheelabrator Corp, 505 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ont.

WHEELABRATOR
AIRLESS BLAST EQUIPMENT

degrees forward to 45 degrees backward is controlled by a handwheel in front of the machine. Sander is available with ½, ¾, or 1 hp motor. —Yates-American Machine Co., Beloit, Wis.

For More Details Circle No. 467—Page 55

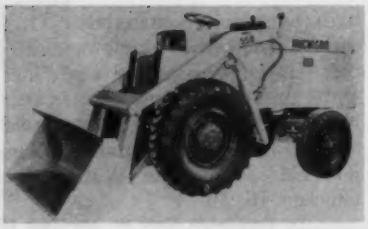
BIN VIBRATOR

Model 6OU vibrator is offered for installation on bin walls of approximately ⅜ in. thickness and of 20-ton capacity. Unit impacts at both top and bottom of the stroke to deliver 7200 impacts per minute at 60 cps. Placement of the mounting lugs at the sides and end of the base is said to provide optimum transmission of the vibratory energy to the bin walls and contents. Vibrator is available for 115, 230, 460, or 575 v ac directly off the power line.—Eriez Mfg. Co., Erie 6, Pa.

For More Details Circle No. 468—Page 55

TRACTOR SHOVEL

Rubber-tired tractor shovel with short turning radius has lift capacity of 5400 lb. Capable of traveling at speeds up to 26 mph in either forward or reverse, Model 55B has a 1-yd bucket and a maximum dumping height of 8 ft. Unit has torque converter and automatic shift. — Construction Machinery Div., Clark Equipment Co., Pipestone Rd., Benton Harbor, Mich.



For More Details Circle No. 469—Page 55

FIBERGLASS SKYLIGHT

Skylight of reinforced fiberglass construction is said to be fire-retardant. Available in sizes varying from 14 x 14 in. to 38 x 74 in., the translucent skylight comes in pale green or white.—Consolidated General Products Inc., Consolite Div., 24th and Nicholson, P. O. Box 7425, Houston 8, Tex.

For More Details Circle No. 470—Page 55

CONVEYOR LUBRICATOR

Conveyor lubricator automatically injects oil or grease in wheel bearings in trucks, dollies, and pallets used with floor conveyors. Model No. 152 is said to operate perfectly in spite of dirt and dust. —Olsen Mfg. Co., 4622 Delemere Blvd., Royal Oak, Mich.

For More Details Circle No. 471—Page 55

DIAMOND HOLE SAW

Diamond hole saw is offered in hole sizes from ½ to 14-in. diam. Natural diamonds are bonded on steel tubes in three grades for use in boring holes in brick, tile, stone, and steel-reinforced concrete. — Robert G. Evans Co., 6020 Troost Ave., Kansas City 10, Mo.

For More Details Circle No. 472—Page 55

GRINDER

Grinder is designed to handle a 6-in. cup wheel for medium heavy duty work, but may be used as a sander. Choice of throttle arrangement includes a butterfly on-and-off throttle with or without detent

EXECUTIVE REPORT #24

APPEARANCES CAN BE DECEIVING

"Low-Price" Abrasives Can Be An Expensive Bargain

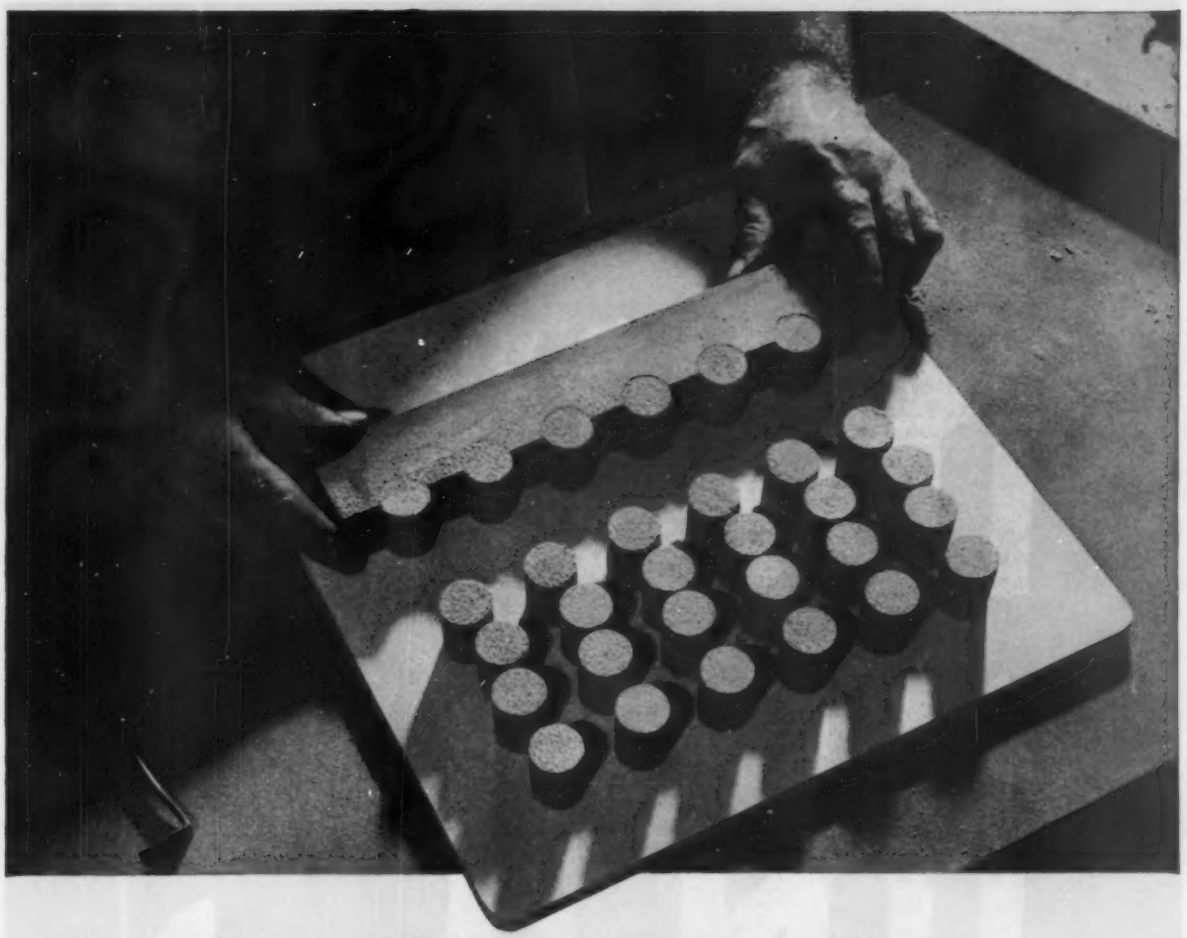
Measure the bars. The top one appears smaller, but it's not. Measure your present abrasive cost, and compare it with the proven low cost of Wheelabrator Steel Shot.

Don't be deceived by a low initial price. It's abrasive performance that gives true blasting economy . . . the lower abrasive consumption, faster cleaning, and lower maintenance enjoyed by users of Wheelabrator Steel Shot. Try it, and take a true measure of blast cleaning economy.

SEE THE PROOF IN YOUR OWN PLANT

Your Wheelabrator abrasive engineer will demonstrate the superior performance of Wheelabrator Steel Shot in your own plant. For data to help you control all your blast cleaning costs, write for Bulletin 905-D. Wheelabrator Corp., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P.O. Box 490, Scarborough, Ont.

WHEELABRATOR
STEEL ABRASIVES



Smoothly sanded Transite Core Plates bring new precision to core production

Tough asbestos-cement composition keeps them true over long service life

Experienced foundrymen know they can depend on Transite® Core Plates for fast, accurate production of precision cores, day in and day out . . . even under heaviest production schedules.

For toughness and durability, these smoothly sanded boards are fabricated of fibrous asbestos and cement in a special Johns-Manville process. Extremely strong and lightweight, they resist shock and corrosion, will not crack or break under normal use. Boards can be easily cleaned, too.

Transite Core Plates have proved themselves in hundreds of ferrous and non-ferrous foundries all over the country. They maintain their smooth, level surface year after year with a minimum of warpage and wear.

FREE new folder gives complete information

Whether or not you now use Transite Core Plates, there are many gains to be had from a careful study of our new folder IN-219A. It gives complete specification data—weights, sizes, thicknesses. *Send the coupon below.*

JOHNS-MANVILLE JOHNS-MANVILLE JM PRODUCTS

Johns-Manville, Box 14, New York 16, N. Y.
(In Canada, Port Credit, Ontario)
Please send me booklet IN-219A at no cost or obligation to me.

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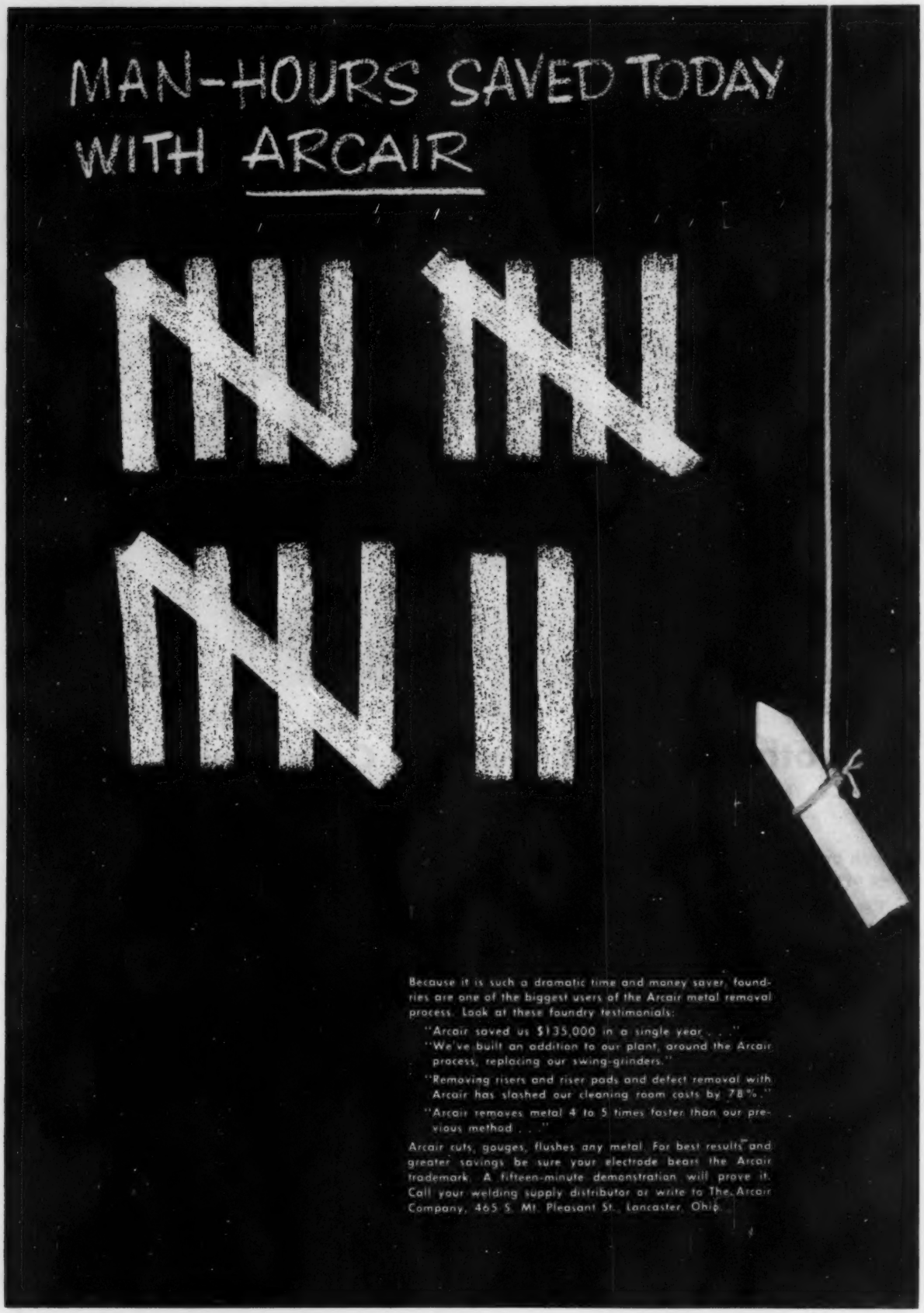
Firm_____

Address_____

City_____ Zone____ State_____

Circle 629 on Page 55

MAN-HOURS SAVED TODAY WITH ARCAIR



Because it is such a dramatic time and money saver, foundries are one of the biggest users of the Arcair metal removal process. Look at these foundry testimonials:

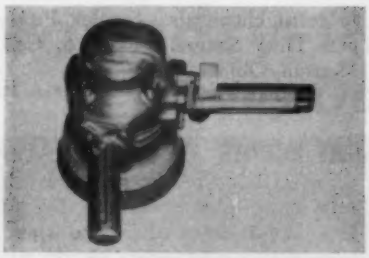
"Arcair saved us $135,000 in a single year. . ."

"We've built an addition to our plant, around the Arcair process, replacing our swing-grinders."

"Removing risers and riser pads and defect removal with Arcair has slashed our cleaning room costs by 78%."

"Arcair removes metal 4 to 5 times faster than our previous method . . ."

Arcair cuts, gouges, flushes any metal. For best results and greater savings be sure your electrode bears the Arcair trademark. A fifteen-minute demonstration will prove it. Call your welding supply distributor or write to The Arcair Company, 465 S. Mt. Pleasant St., Lancaster, Ohio.



or a standard lever throttle. The dead handle can be changed from 90 to 120 degrees from the throttle handle by rotation, or it can be removed entirely. Unit has a stainless steel governor adjustable to maintain the proper speed.—**Cleco Div., Reed Roller Bit Co.**, 5125 Clinton Dr., Houston 20, Tex.

For More Details Circle No. 473—Page 55

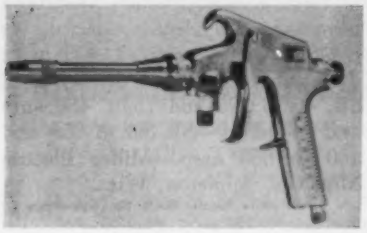
OVERHEAD CRANE COMPONENT

Crane end trucks are available for users wishing to assemble their own overhead traveling cranes. All necessary components except structural steel bridge girder and driveshaft are supplied. Both light and heavy duty models are available in spans up to 50 ft. Load capacities range from 1 to 10 tons. Complete assembly instructions are furnished, and various accessories are available. — **Robbins & Myers Inc.**, Springfield, Ohio.

For More Details Circle No. 474—Page 55

CLEANING GUN

Pressure cleaning gun Model CGA-504 is adjustable to deliver a discharge from a high velocity spray down to a gentle mist and



can be used with all common cleaning and degreasing materials. Lightweight, it consists of a brass nozzle and extension tube and an aluminum gun body. The extension nozzle permits spraying into cavities and hard-to-reach areas. Unit is designed to operate with 6.5 cfm at 60 psi.—**DeVilbiss Co.**, Toledo 1, Ohio.

For More Details Circle No. 475—Page 55

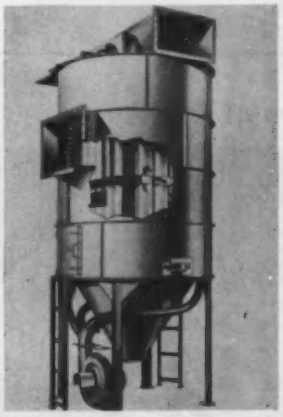
FLOOR REPAIR COMPOUND

Jiffy Floor is a plastic material for filling cracks, expansion joints, or shallow holes in concrete or plank floors. Material can be applied in a few minutes, indoors or out. It is claimed to be waterproof, dustless, skid-resistant, and noiseless. —**Monroe Co.**, 10603 Quebec Ave., Cleveland 6, Ohio.

For More Details Circle No. 476—Page 55

DUST COLLECTOR

Cylindrical fabric dust collector reclaims materials in a dry state. Dust-laden air is either drawn or blown into the inlet plenum at the top of the Amerjet Model B collector. The dust then enters one of several 9-in. diam filter bags where the velocity of the air holds it against the sides of the bags. To clean the bags, a ring with air nozzles is passed up and down the outside of each bag, causing the dust to fall to the bottom where it is emptied out of a funnel. This design is claimed to allow the col-



lector to operate with only ¼ the number of bags necessary on a similar, conventional collector.—Dept. PD, **American Air Filter Co.**, 215 Central Ave., Louisville 8, Ky.

For More Details Circle No. 477—Page 55

IMPACT TOOL

Size 808 Impactool delivers 1100 impacts per minute, has a free speed of 6000 rpm, and handles work up to ⅝-in. bolt size. Unit is 7¼ in. long, with a side to center distance of 1½ in., and weighs only 8⅞ lb. In addition to the standard ⅝-in. square driver, others are available with ¾ in. and ½ in. across flats. Accessories include 3, 6, and 8-in.

extended anvils as well as anvils for screwdriver bits and socket drivers.—**Ingersoll-Rand Co.**, 11 Broadway, New York 4, N. Y.

For More Details Circle No. 478—Page 55

SURFACE PLATE

Surface plate made from high-quartz granite is available with an over-all surface tolerance guaranteed to 10 millionths in. Sizes range from 8 by 12 in. to 30 by 42 in. in no-ledge, two-ledge, and four-ledge styles. Threaded inserts can be provided in the plates for attaching special fixtures.—**Herman Stone Co.**, 1860 North Bettysburg, Dayton 27, Ohio.

For More Details Circle No. 479—Page 55

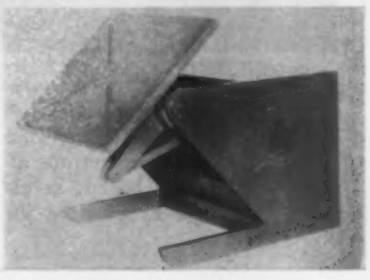
RUBBER REPAIR MATERIAL

General purpose repair material is rubber in paste form to be used to seal or caulk around machinery, insulate electrical equipment, make gaskets, and to be a protective coating for machinery. It also can be used to repair torn conveyor belting, fix cracks in masonry walls, repair ripped canvas covers or tarps, and to skidproof wet floors.—**Devcon Corp.**, Danvers, Mass.

For More Details Circle No. 480—Page 55

WORK POSITIONER

Toggle tilt work positioner is designed to simplify weldment handling and facilitate both welding and finishing operations. Unit features a toggle lever and segmented



drive gear to tilt and rotate the turntable. Capacities range from 2500 to 25,000 lb with table heights varying from 34½ to 95 in. The 30 to 54-in. square turntable tilts through a 135-degree arc. Various speed controls are offered.—**World Electric Co.**, 4614 Prospect Ave., Cleveland 3, Ohio.

For More Details Circle No. 481—Page 55

SLIDING TAPE

Sliding tape of solid nylon is available in five widths from ¼ to 1 in. Self-adhering, it is used on work tables to permit smooth sliding of parts being drilled, sanded, etc. Called Nyl-O-Tape, it is also used to reduce friction wear.—**Hardware Designers Inc.**, P. O. Box 4, South Hackensack, N. J.

For More Details Circle No. 482—Page 55

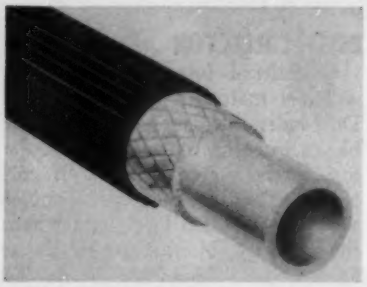
X-RAY WRISTBAND

Wristband is worn at the wrist when handling radioisotopes, lining up x-ray diffraction instruments, or working near a radiation source. Unit is designed to accommodate two filmbadges, one to check weekly exposures and one for 13 week intervals.—**St. John X-Ray Laboratory**, Califon, N. J.

For More Details Circle No. 483—Page 55

PRESSURE HOSE

Synflex pressure hose is designed to replace hose built to SAE specification 100R1 single wire braid. A tube of inert polyamide is wrapped



in a braided synthetic, which in turn is covered with a sheath of extruded plastic. Available with ID of 3/16 to ⅜ in., hose is said to be flexible and light in weight, to have good mechanical strength, and to resist chemicals.—**Synflex Products Div., Samuel Moore & Co.**, Mantua, Ohio.

For More Details Circle No. 484—Page 55

GAS BURNER

Series 223 XSA burner is available in air pipe sizes from 1½ to 4 in. and is designed for use where large amounts of excess air are advantageous in securing temperature uniformity. The gas or dual-fuel burner will also work equally well on normal or rich air-fuel ratios and at 16 psi air pressure, can produce a range of 354,000 to 2,600,000 Btu for dual-fuel sizes or 354,000 to 3,250,000 Btu for the gas sizes.—**North American Mfg. Co.**, 4455 E. 71st St., Cleveland 5, Ohio.

For More Details Circle No. 485—Page 55

WELDER

Silver Star dc, rectifier-type welder saves cost because it is designed specifically for indoor use, and hor-

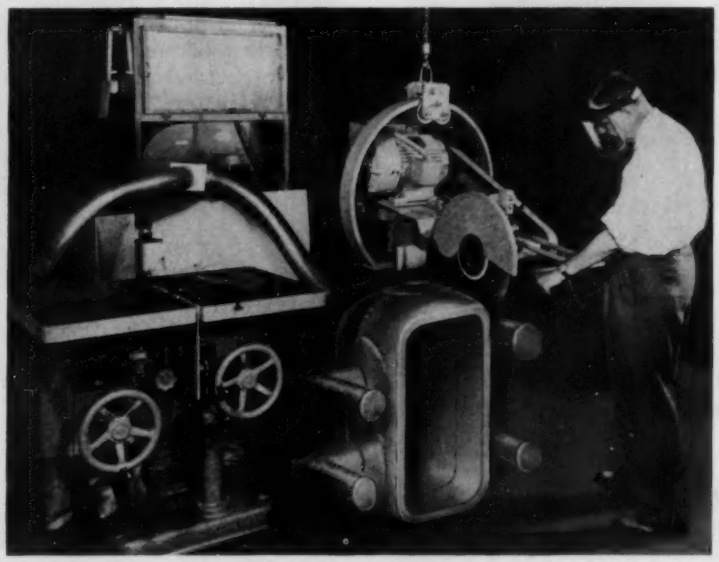
izontal design saves space in stacking. Other features include completely sealed semimetallic rectifier, lifetime cooling system, Cam-lok terminals, and electric control. It is offered in two models, each with dual current ranges: Model H-3-SR, 40 to 295 and 75 to 450 amp and Model H-4-SR, 50 to 350 and 100 to 600 amp.—**Miller Electric Mfg. Co.**, Appleton, Wis.

For More Details Circle No. 486—Page 55

TUMBLING BARREL

Tumbling barrel Model XLC-2120 is designed for either wet or dry processes. Unit is supplied unlined or lined with ¼-in. abrasion-resistant neoprene. Two types of drive are offered for constant or variable speed operation. Standard equipment includes a magnetic start-and-stop electric control switch

Machine Cuts Off Risers at Any Angle

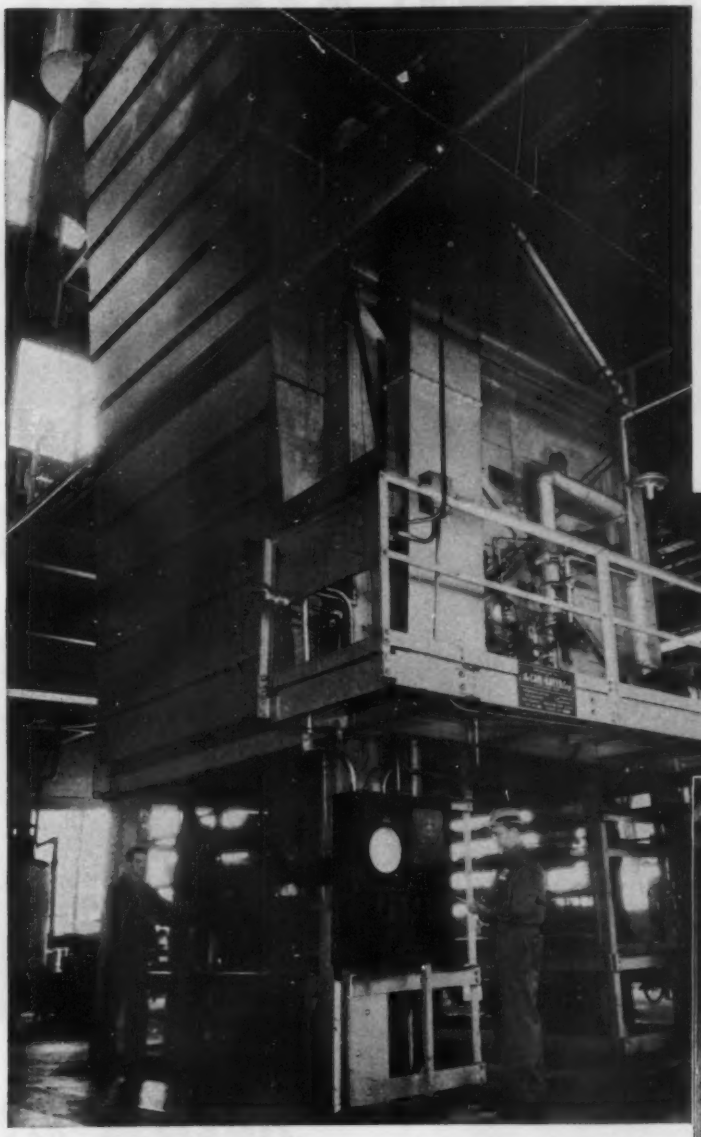


Swing-frame, Tabor-Brasive cut-off machine is designed to make up to 6-in. cuts of any commercial ferrous or nonferrous alloy. Castings can be cut at almost any angle by pivoting the head inside the ring, or by rotating the entire head. The unit is shown cutting a side riser from an aluminum casting. — **Tabor Mfg. Co.**, Lansdale, Pa.

For More Details Circle No. 493—Page 55

Foundry-Proven Money Makers!

Ovens Designed by carl mayer CORP.



The Carl Mayer Corp. experience in engineering and designing industrial ovens and furnaces is second to none! Carl Mayer ovens incorporate recirculating heating systems with sealed combustion chambers and automatic temperature controls for all fuels. Cores and molds are evenly baked faster, with less fuel consumption.

Many foundries of all sizes have found it pays to install Carl Mayer ovens—Our engineers will be glad to work with you on your oven problems. Write or call now!

A NEW VERTICAL CORE OVEN Installed at Forest City Foundry, Cleveland, Ohio. Size is 12' 7" x 11' 10" x 57' 8" high above floor. 29 carriers, 3 shelves high; each shelf 30 x 106 inches. Features forced cooling and exhaust system for uniform cooling of cores before unloading.

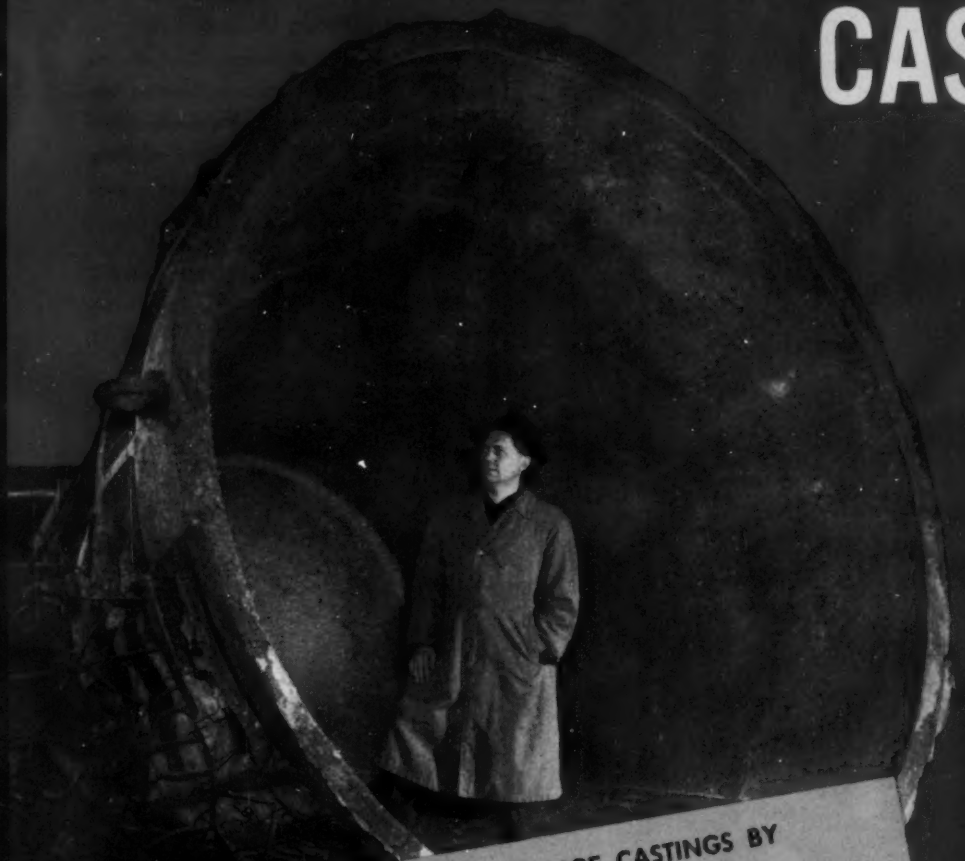
CAR TYPE MOLD OVEN at American Brake Shoe Co. features under floor chain car puller. Size 10' x 10' x 19' long.

THE carl mayer CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories

America's MOST ADVANCED CASTINGS are being made by the



Example—LARGE CASTINGS BY

PITTSBURGH STEEL FOUNDRY COMPANY

TEXTRON INC.

Representative of this progressive organization's work with KOLD-KURE—a 400 cubic ft. steel slag ladle, with 5" metal sections.

KOLD-KURE®

NO-BAKE PROCESS

Circle 632 on Page 55

The world's most advanced binder, KOLD-KURE performs like KOLD-SET, while eliminating completely the baking process. *Main Characteristics:* Assured dimensional accuracy in finished castings . . . Excellent sand flowability and collapsibility . . . Sharply reduced rodding . . . No objectionable odors . . . Simplified mixing . . . Only two additives—activator and binder.

A TEST IN YOUR FOUNDRY? Let our Technical Service Specialists demonstrate how you can make more profitable castings—through the KOLD-KURE Process.

Let us send full details

NEW TECHNICAL BULLETIN

This will answer essentially all the technical questions you likely will raise.

FOR FOUNDRY PRODUCTS PROGRESS

G. E. SMITH, INC.

345 WASHINGTON ROAD
PITTSBURGH 16, PA.

Warehouse Stocks in Boston • Chicago • Philadelphia • Detroit • Indianapolis
San Gabriel, Calif. • Hamilton • Toronto • Montreal

with thermal overload protection and a system to separate the work and the abrasive.—**Tumb-L-Matic Inc.**, St. Mary's Street, Stamford, Conn.

For More Details Circle No. 487—Page 55

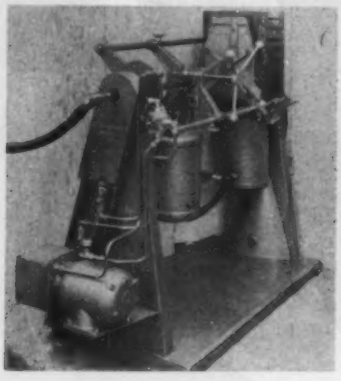
FILLET MATERIAL

Permanent pattern fillets in radiuses of 1/8, 3/16, and 1/4 in. can be applied with pliable, preshaped, plastic material. To apply, cut to size with scissors or a knife, apply adhesive to the pattern and to the fillet material and press into place. —**Jo-El Co.**, 16805 Albers Ave., Cleveland 11, Ohio.

For More Details Circle No. 488—Page 55

POWER ROLLOVER UNIT

Power rollover unit for company's 200 and 100 S series shell core machines enables an operator to roll, invest, rock, and drain a corebox at any speed using a single lever. The unit is optional equipment on new machinery and can be added to machines already in use. It consists of a hydraulic system with motor, pump, reservoir, and relief valve.—**Dependable Shell Core Machines Inc.**, P. O. Box 2183, Portland 14, Oreg.



For More Details Circle No. 489—Page 55

FIRE EXTINGUISHER

ABC Allclass fire extinguisher is approved by Underwriters Laboratories for use against the four standard classes of fires. A special powder forms a deposit on the burning object which extinguishes the fire and prevents re-ignition. This coating is nonconductive for electrical fires. No annual recharge is necessary, and the extinguisher easily can be checked visually.—**Alim Corp.**, 11 Park Place, New York 7, N. Y.

For More Details Circle No. 490—Page 55

PORTABLE INTER-COM RECEIVER

Voice-director is an all-transistorized shirt-pocket personal radio communications receiver which weighs only 12 oz with battery. No external antenna is necessary since the radio uses a built-in ferrite loopstick. A 6½-v battery powers the radio to receive transmissions from any base station transmitter, two-way radio in a car, or portable unit operating in the 150-174 mc range. Either a plastic horn which can be clipped to the lapel or an ear-piece can be used.—**General Electric Co.**, Communication Products Dept., Lynchburg, Va.

For More Details Circle No. 491—Page 55

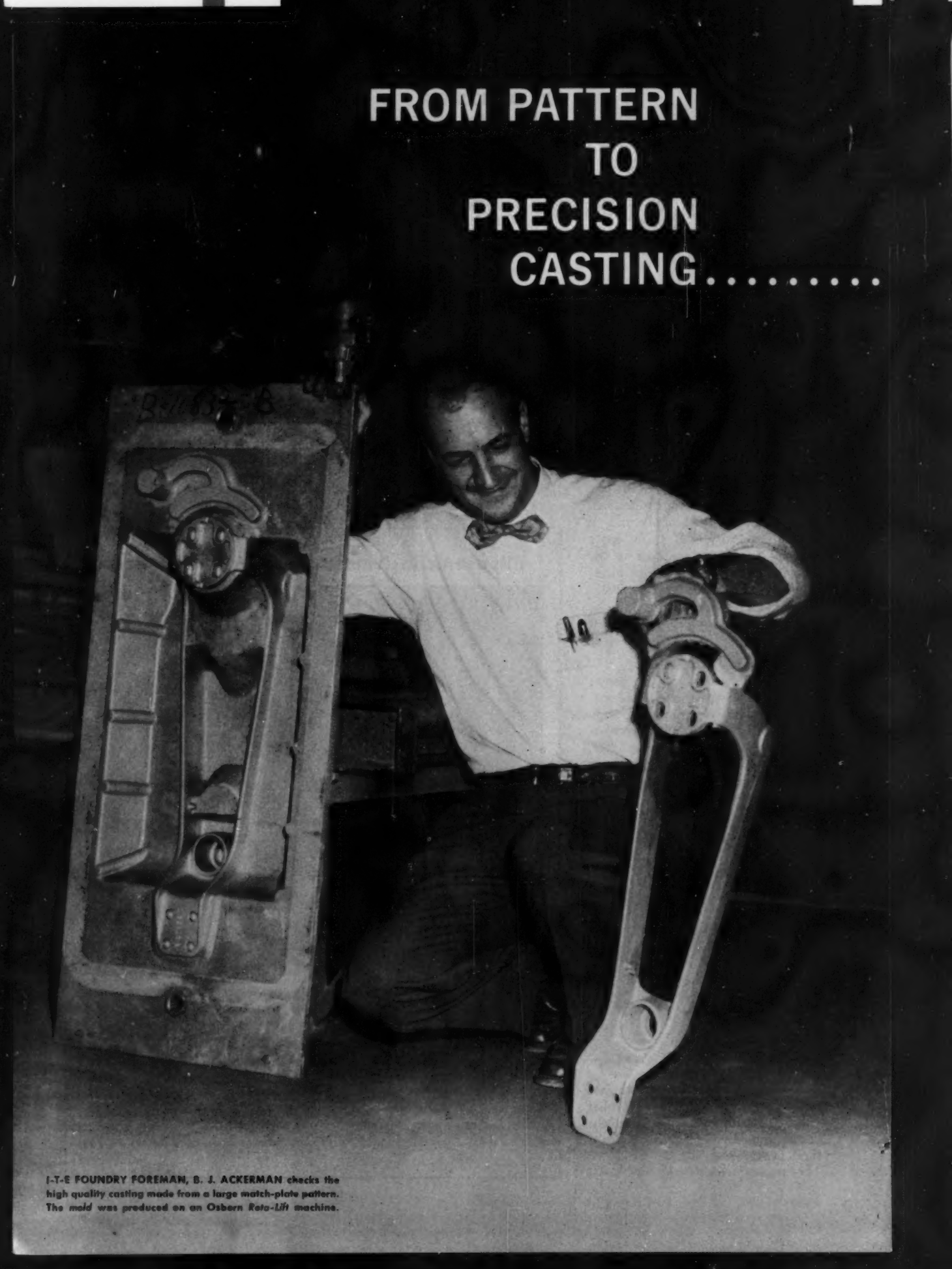
Ultrasonic Instrument Tests Wall Thickness

Transistorized, battery-operated, ultrasonic instrument is designed to measure wall thickness between 0.025 and 2.50 in. Measurements are said to be accurate to ±1 per cent. Designated Sonizon SO-300, the unit is claimed to give instantaneous readings when a transducer is placed on the surface to be measured and a dial is turned. The instrument is portable and is housed in a plastic case which measures 8½ x 9½ x 11¼ in.

In addition, a separate carrying case is provided for batteries. — **Magnaflux Corp.**, 7300 W. Lawrence Ave., Chicago 31, Ill.

For More Details Circle No. 494—Page 55

FROM PATTERN TO PRECISION CASTING.....



I-T-E FOUNDRY FOREMAN, B. J. ACKERMAN checks the high quality casting made from a large match-plate pattern. The *mold* was produced on an Osborn *Roto-Lift* machine.

"PERFECT MATCH"

. . . and OSBORN Rota-Lift® with new match-plate handler does the molding job with more speed . . . more profit

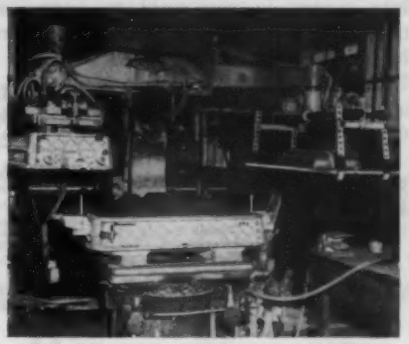
They're proving it at I-T-E Circuit Breaker Co. where this Osborn *Rota-Lift* Molding Machine has been running a wide variety of work for over a year. The score: production and quality *up* . . . costs and operator fatigue *down* because *Rota-Lift* mechanizes all major match-plate molding operations: jolt, roll, squeeze, draw and close.

I-T-E—here at its Greensburg, Pennsylvania foundry—has been producing relatively large match-plate molds, similar to the 15″x32″–6″ drag, 7″ cope mold shown in the photo sequence below. And they found the new *Osborn match-plate handler* especially efficient on jobs involving extra-heavy pattern plates.

For any jobbing or semi-production foundry—Osborn will recommend the right model *Rota-Lift* to improve your molding operation . . . help keep your quotes competitive . . . let you handle a wider range of work . . . at a profit. Write for details. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

HOW ROTA-LIFT® MOLDING MACHINE MECHANIZES OPERATIONS AT I-T-E

DRAG HALF of mold filled and jolted. . . bottom board secured. Operator easily rolls over the mold on *Rota-Lift* rollover arms prior to filling cope and squeezing.



ROTA-LIFT MATCH-PLATE HANDLING DEVICE —shown swung out at right—has drawn pattern from drag. Cope mold is swung out at left . . . drag half of mold rests on *Rota-Lift* table. Operator now ready to return cope and close mold.

MOLD CLOSED—operator uses I-T-E's efficient chain sling setup with overhead crane and monorail system to transfer mold to pouring conveyor. Flasks are opened and removed to complete the operation.

FEMA

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue, Cleveland 14, Ohio

OSBORN®

MOLDING MACHINES • CORE BLOWERS • METAL FINISHING MACHINES • INDUSTRIAL BRUSHES

Circle 633 on Page 55

Revised Specification for Gray Iron Castings Includes Major Changes

By EDWIN BREMER
Metallurgical Editor

● NUMEROUS and important changes are included in the recently issued, revised ASTM Specification for Gray Iron Castings. Also it has been reverted to tentative status and now is designated A48-60T. One of the changes is that castings are classified only on the basis of tensile strength in separately cast test bars.

Another is designation of the class of the iron by relation of tensile strength in specified sizes of separately cast test bars as indicated in Table I. Where the purchase order does not include the class letter identifying the size of test bar, the manufacturer shall have the option of selecting a suitable size of bar.

In turn, the several test bars are correlated with the wall thickness of the controlling section of the casting as shown in Table II. Much shorter test bars are specified, as may be seen in Table III. In all the tables it should be noted that test bar S is special and is intended for use where standard test bars are not satisfactory.

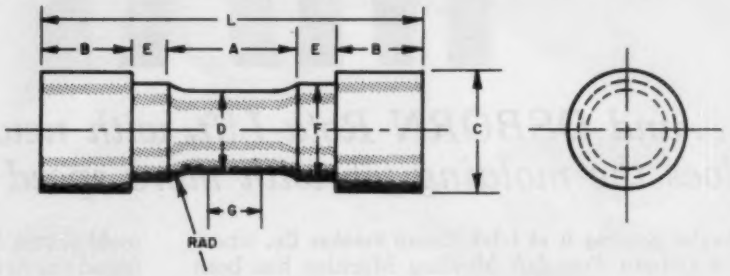
The test bars shall be cast in dried or baked molds made mainly of an aggregate of siliceous sand with appropriate binders. Average grain size of sand shall approximate that used in the molds for castings. Test bar molds shall be approximately at room temperature when poured.

Bars intended to represent castings cooled in the mold to less than 900° F before shakeout shall be cooled in their molds to less than 900° and then may be cooled in still air to room temperature. Bars intended to represent castings hotter than 900° F on shakeout shall be cooled as previously described or, by agreement, may be shaken out of their molds at approximately the same temperature of the castings. Test bars shall receive the same treatment as, and shall be treated adjacent to, the castings they represent.

Dimensions

	Tension-Test Specimen A	Tension-Test Specimen B	Tension-Test Specimen C
G—Length of parallel, min, in.	0.50	0.75	1.25
D—Diameter, in.	0.500±0.010	0.750±0.015	1.25±0.025
R—Radius of fillet, min, in.	¼	⅜	½
A—Length of reduced section, min, in.	1¼	1½	2¼
L—Over-all length, min, in.	3½	4	6½
C—Diameter of end section, in., approximately	¾	1⅛	1⅞
E—Length of shoulder, min, in.	¼	¼	⅜
F—Diameter of shoulder, in.	⅝±1/32	⅞±1/32	1 7/16±1/32
B—Length of end section	*	*	*

*Optional to fit holders on testing machine. If threaded, root diameter shall not be less than dimension F



Dimensional data for tension test specimens

TABLE I—Requirements for Tensile Strength of Gray Cast Irons in Separately Cast Test Bars

Class No.	Tensile Strength, Min, Psi	Test Bar Diam, In.	Class No.	Tensile Strength, Min, Psi	Test Bar Diam, In.
20 A	20 000	0.88	40 A	40 000	0.88
20 B	20 000	1.2	40 B	40 000	1.2
20 C	20 000	2.0	40 C	40 000	2.0
20 S	20 000	Bar S*	40 S	40 000	Bar S*
25 A	25 000	0 88	45 A	45 000	0.88
25 B	25 000	1.2	45 B	45 000	1.2
25 C	25 000	2.0	45 C	45 000	2.0
25 S	25 000	Bar S*	45 S	45 000	Bar S*
30 A	30 000	0.88	50 A	50 000	0.88
30 B	30 000	1.2	50 B	50 000	1.2
30 C	30 000	2.0	50 C	50 000	2.0
30 S	30 000	Bar S*	50 S	50 000	Bar S*
35 A	35 000	0.88	60 A	60 000	0.88
35 B	35 000	1.2	60 B	60 000	1.2
35 C	35 000	2.0	60 C	60 000	2.0
35 S	35 000	Bar S*	60 S	60 000	Bar S*

*All dimensions of test bar S shall be as agreed on between the manufacturer and the purchaser

TABLE II—Test Bars for Use When Specific Correlation Has Not Been Established Between Bar and Casting

Thickness of the Wall of the Controlling Section of the Casting, In.	Test Bar
Under 0.25	S
0.25 to 0.50	A
0.51 to 1.00	B
1.01 to 2	C
Over 2	S

TABLE III—Dimensions of Cast Test Bars

Test Bar	As-Cast Diam, In.			Length, In.	
	Nominal (Mid-Length)	Minimum (Bottom)	Maximum (Top)	Minimum (Specified)	Maximum (Recommended)
A	0.88	0.85	0.90	5.0	6.0
B	1.20	1.14	1.26	6.0	9.0
C	2.00	1.90	2.10	7.0	10.0
S*	...	...	...	..	..

*All dimensions of test bar S shall be as agreed on by the manufacturer and the purchaser

Circle 634 on Page 55→

"...and safe at 150% of specified maximum speed..."

Every Peninsular wheel must pass this test—must prove before delivery to you that it can safely take half again as high a speed as the maximum safe speed recommended.

It is one of a series of grueling tests developed by Peninsular to make sure that its wheels—vitrified or resinoid—are the safest and highest performance wheels you can find anywhere.

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CO_2 Cores need TOP-BOND

Green Sand Cores need TOP-BOND

Molds and Gates need TOP-BOND

We all need TOP-BOND

For a Finer Casting Finish

WHAT IS TOP-BOND?

—a resin bond for surface sand

—a spray that *AIR DRIES FAST*

—a surface hardening medium for cores and molds

—a way to retard moisture pick-up

Now there is an answer for problem jobs where a harder surface on cores and molds is important. Cores made with the CO_2 process will develop the hardness of baked cores in a matter of minutes when sprayed with Top-bond. Air drying is fast and complete. Your hardness tester will verify high scratch resistance and added protection against abrasion.

When Top-bond is used as a spray for molds, surface sand is tied down tighter with a resin bond and gates show added resistance to sand pick-up. Visual evidence that the spraying is done evenly can be had by adding a few ounces of Iron Oxide to a gallon of Top-bond.

Steel foundries need Top-bond for green sand cores and molds. Real money that one foundry saved was put down in writing by their research division and these results are included in a folder that describes Top-bond in detail. It is yours for the asking.

Top-bond can be vital for better castings.

UNITED OIL MFG. COMPANY

1429 WALNUT STREET, ERIE, PA.

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All test bars shall be machined to prescribed dimensions as given in the accompanying illustration. With reference to test bar C it is stated that unless the size of the tension-test specimen to be machined from test bar C is specified in writing by the purchaser, the decision whether to use tension-test specimen B or C shall be made by the manufacturer of the castings. At least two test bars shall be cast and prepared for each lot of castings.

If any test specimen shows defective or improper machining or obvious lack of continuity of metal, it may be discarded and replaced by another bar from the same lot. In case of failure of a test specimen to conform to the specification, one retest may be made from another test bar from the same lot. If the retest also fails, the castings shall be rejected.

A lot of castings is defined as follows:

1. A group of castings weighing less than 2000 lb each when poured continuously within 2 hours from the same melt and from consecutive charges consisting of essentially the same percentages and types of materials.

2. A group of castings weighing less than 2000 lb each when the total weight of the group does not exceed 8000 lb and all the castings in the group are poured within 4 hours from the same melt and from consecutive charges consisting of essentially the same percentages and types of materials.

3. Individual castings weighing 2000 lb or more.

4. One ladle of iron weighing over 2000 lb. 4b. When an individual casting is poured from more than one ladle of iron, and the iron for that casting is melted in more than one melting unit or from a different melt or a different type of charge in the same melting unit, the iron from each melting unit, melt, or type of charge shall be considered a different lot. 4c. When more than one lot of iron is used to pour a single casting, the iron in each lot must conform to the specification. 4d. When an individual casting is poured with iron melted in more than one melting unit or from more than one melt or type of charge in the same melting unit and the irons from the different sources are mixed together thoroughly in the ladle before the casting is poured, the mixed iron in that ladle may be considered one lot.

When agreed on in writing by the manufacturer and the purchaser, it may be necessary for the castings to meet special requirements as to hardness, pressure tightness, radiographic soundness, dimensions, surface finish, etc.

When agreed on in writing by the manufacturer and purchaser, a certification shall be made the basis of acceptance of the castings. This shall consist of a copy of the manufacturer's test report or a statement by the supplier, accompanied by a copy of the test results, that the material has been sampled, tested, and inspected in accordance with the provisions of this specification. Each certification so furnished shall be signed by an authorized agent of the manufacturer.

Gray Iron Founders' Society Plans for Annual Meeting

Appraisal of problems and opportunities in the industry will be considered at the 32nd Annual Meeting of the Gray Iron Founders' Society, to be held at the Netherland Hilton Hotel, Cincinnati, Oct. 12-14. Details of the program follow:

Wednesday, Oct. 12

9:30 a.m.—Directors' Meeting
2 p.m.—Registration
6 p.m.—President's Reception and Dinner—Beverly Hills Club, Newport, Ky.

Thursday, Oct. 13

8 a.m.—Registration
9 a.m.—Annual Meeting, President A. M. Nutter, E. L. LeBaron Foundry Co., Brockton, Mass., presiding
9:15 a.m.—Reports of Officers
10 a.m.—GIFS Film: "Rice Bowls to Rockets"
10:45 a.m.—"Needed—A Long-Range Advertising and Public Relations Program," Peter R. Rentschler, chairman of Advertising Committee; and John Ashby, Ashby & Associates
12:30 p.m.—Industry Luncheon: Speaker, O. R. Strackbein, chairman, The Nation-Wide Committee on Import-Export Policy, Washington
2 p.m.—"Your Industry—Where Does It Go From Here?" James A. Wyatt and Harry Figgie, Booz, Allen & Hamilton, New York, and Cleveland
4 p.m.—"Let's Get Started!" Dr. G. Herbert True, Visual Research Inc., South Bend, Ind.
7:30 p.m.—Industry Banquet

Friday, Oct. 14

9 a.m.—Premier Showing of GIFS Technical Strip Films: "Metallurgy of Cast Irons," "Properties of Gray Iron," and "Properties of Ductile and High Alloy Cast Irons"
10 a.m.—Explanation of GIFS Three-Year Film Program—R. C. Meloy, marketing director
11 a.m.—"Co-operative Research Pays Off," H. W. Lownie, Chief, Process Metallurgy Research, Battelle Memorial Institute, Columbus, Ohio
12:30 p.m.—Industry Luncheon: Introduction of New Officers and Directors, and Presentation of Awards. Speaker: Tom Campbell, Editor, *Iron Age*
3 p.m.—Cracker Barrel Sessions: Ductile Iron; Production Foundries; Production Control for Jobbing Foundries; and Recruiting and Compensation of Castings Salesmen
4:30 p.m.—Adjournment

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TIFFIN QUALITY

"Mark of Quality"

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A TIFFIN FOUNDRY Quality Melting Pot for all Non-ferrous Metal.

SPECIAL SERVICE TO DIE CASTERS—NOZZLES, PLUNGERS, DIE BASES, THERMOCOUPLE TUBES, BAR STOCK AND POTS.

Custom castings of goosenecks and miscellaneous parts.
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- **REAL ECONOMY**—Pound for pound of melted metal, it costs less when you use Tiffin Foundry Quality Pots.
- **SPECIAL POTS** available. Send us your specifications.
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SPECIFY the pot with the trademark of quality—they are engineered to last.

THE TIFFIN FOUNDRY, INC.
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Circle 636 on Page 55

Industry Briefs

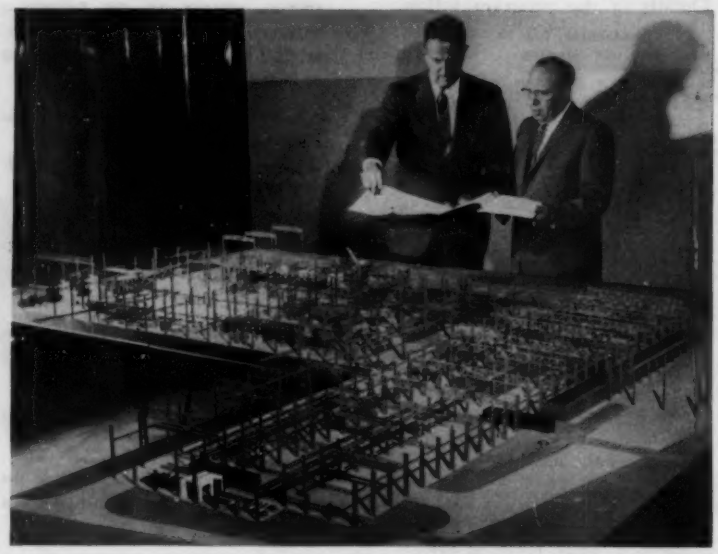
National Cash Register Co., Dayton, Ohio, is constructing a new building to house its foundry, pattern shop, and machine shop. The two-story, 142,000-sq-ft structure will cost over $1 million and is expected to be completed by fall of 1961. In addition, NCR will spend $750,000 on new furnaces, exhaust systems, and other foundry equipment. Two buildings which will be replaced by the new structure will be razed.

Bauer Equipment & Supply Co., 139 N. Clark Street, Chicago 2, has been formed by Eugene C. Bauer Jr. to engage in sales and engineering of manganese steel, alloy steel, Ni-Hard, malleable iron, friction iron, and carbon steel castings.

International Minerals & Chemical Corp., Skokie, Ill., has reorganized its Industrial Minerals Div. by consolidating Eastern Clay Dept. and Consolidated Feldspar Dept. into one sales and production organization serving the foundry, ceramic, and oil well drilling industries. E. W. Claar, former manager of Eastern Clay, becomes general sales manager, and C. P. Loucks, former production manager of Eastern Clay is general production manager for the division. T. E. Barlow is foundry sales manager.

Coleman Cable & Wire Co., 1900 N. River Rd., River Grove, Ill., has been named a distributor of wire rope, chain, and slings for the Wire Rope Div., Jones & Laughlin Steel Corp.

Cooper - Bessemer Corp., Mount Vernon, Ohio, is constructing a building to house its recently-formed En-Tronic Controls Div. The division will handle complete systems engineering for precise control of engine and compressor units. The building will be air-conditioned to regulate temperature and humidity during assembly of control components.



GIFT MODEL: This model of the proposed modernization of a steel foundry making railroad, armor, and commercial castings has been presented to the University of Illinois by Lester B. Knight & Associates, Chicago. It is valued at $10,000 and is on a scale of ⅛ in. to 1 ft. Looking it over are Lester B. Knight, Lester B. Knight & Associates, at left, and Prof. Roy W. Schroeder, University of Illinois at Navy Pier

H. Kramer & Co., Philadelphia, has announced that its division located at El Segundo, Calif., will sell and distribute slab zinc, notch bar zinc, and brighteners. This development follows purchase of the zinc distilling operation of Aetna Metals Co., Los Angeles.

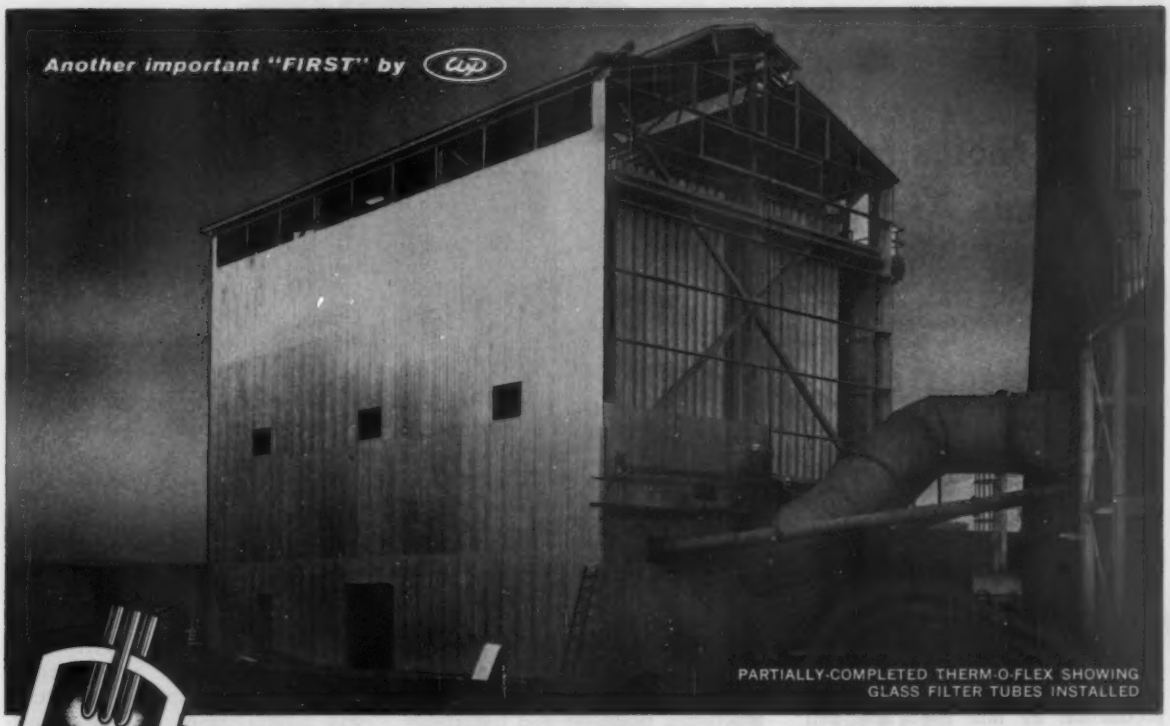
Master Power Corp. has moved into a new plant at 6225 Cochran Rd., Solon 39, Ohio. The company is a subsidiary of Black & Decker and has doubled its facilities with the move.

Devcon Ltd., Toronto, Ontario, Canada, has been formed to sell Devcon products in Canada. George Giles is serving as general manager.

Elliott Addressing Machine Co., Cambridge, Mass., has sold its wholly owned subsidiary, Whitman Foundry Inc., Whitman, Mass., to Alexander Beck. Mr. Beck was president of the establishment and operated it for the parent organization. The foundry produces gray iron and semi-steel castings and has one 15-ton cupola, four 60-lb crucible furnaces, and pattern, machine, and welding shops. No changes in operation are contemplated.

Aluminum Co. of America, Pittsburgh, has announced completion of a multimillion dollar program for improved operations at its primary smelters. The program was aimed at improving the quality of primary aluminum produced by these facilities. The company has abandoned use of the term "pig" as a designation for primary aluminum products, which now will be described as "ingot."

James B. Clow & Sons Inc. has joined with General Industries Ltd., Melbourne, Australia, to build a 3 million cast iron pressure pipe plant in Melbourne. The new company



PARTIALLY-COMPLETED THERM-O-FLEX SHOWING GLASS FILTER TUBES INSTALLED

To Clean Electric Furnace Fumes To 550° F.

A MAJOR STEEL COMPANY

SELECTS THERM-O-FLEX GLASS FILTERS!

SELECTION MADE AFTER EXTENSIVE PILOT PLANT STUDIES PROVED "THERM-O-FLEX" ADVANTAGES

To insure clean gas emission from its large electric furnace operations, a major steel company has installed a Western Precipitation "Therm-O-Flex" Hi-Temperature Filter system —*the filter system featuring silicone-treated glass bags that efficiently clean gases as hot as 550° F!*

This is one of the first steel plant installations to use glass bag filters for cleaning electric furnace emissions, the installation being made only after an exhaustive pilot plant study. Subsequent operation of the full size installation has clearly substantiated the pilot plant results and has demonstrated the unusually high collection efficiency of "Therm-O-Flex" equipment on this type of application.

No Shaking Required

In addition to their ability to handle unusually hot gases, the specially-treated woven glass filters of the "Therm-O-Flex" permit the filter units to be easily cleaned by simply collapsing the bags. *No destructive shaking processes are required.*

Furthermore, the large diameter filter tubes (12" in diameter) provide more efficient cleaning of the collected material on each collapsing cycle—another operating advantage engineered into each "Therm-O-Flex" installation by Western Precipitation dust control "know-how."

"Therm-O-Flex" is one of six types of gas cleaning equipment offered by Western Precipitation— *"Cottrell" Electrostatic Precipitators, "Multiclone" Centrifugal Collectors, "CMP" Combination Multiclone-Precipitator units, "Therm-O-Flex" Hi-Temp Filters, "Dualaire" Jet-Cleaned Filters, and "Turbulaire-Doyle" Scrubbers.* No other organization provides such wide range dust collection experience — no other offers such unbiased recommendations to fit the requirements of *your particular* operations. You simplify your gas-cleaning problems by bringing them to Western Precipitation.

Send for "Therm-O-Flex" Bulletin #F105R

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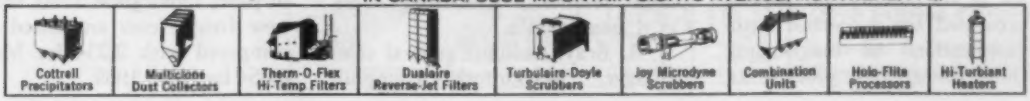


HOW To Do It

FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published

Pig Molds for Nonferrous Metals Are Made of Pipe

By H. J. GERBER
Assistant Professor
Metalworking Technology
Oklahoma State University
Stillwater, Okla.

INEXPENSIVE pig molds are easy to make and useful for end-of-run pigging of aluminum or other nonferrous metals.

A half-section of steel pipe (5-in. pipe was used in the mold illustrated) is cut at an end draft angle of about 10 degrees. A rectangular piece of steel plate then is welded to each end to close the pipe section and provide feet for placing the mold on the floor.

These molds are useful particularly in foundries which refine their own scrap and pig it for future use.

will be owned equally and jointly and will be known as Metters-Clow Pty Ltd. It is scheduled to begin production by late 1961 and will employ 100 persons.

F. J. Stokes Corp., Philadelphia, has moved its Chicago sales office to the Lincoln Bldg., 5875 N. Lincoln Ave., Chicago 45, Ill.

Aluminum Co. of America has announced the closing of its Bridgeport, Conn., works within the next 12 months. All aluminum sand and permanent mold castings business is to be transferred to other company operations. Company officials said that the Bridgeport foundry's location and facilities have become obsolete with changing conditions. Operations will continue at Bridgeport until arrangements can be made to shift the work to other Alcoa plants.

Magnesium Association To Hold Convention in Cleveland

The Magnesium Association will hold its 16th Annual Convention Oct. 17, 18, and 19 at the Pick-Carter Hotel, Cleveland. Theme of the convention will be "Blueprint for Magnesium."

Association President Otis Grant said "All of the twenty-odd papers to be presented are concerned with those applications of magnesium which hold the greatest promise as major potential markets in the next few years." In addition to the formal papers, clinics covering manufacturing problems and techniques will be held.

Technical sessions and informal displays, featuring unusual casting and fabricating accomplishments, will be open to all persons interested. Detailed programs are available from Jerry Singleton, executive secretary, Magnesium Association, 122 E. 42nd St., New York 17, N. Y.

Steel Founders' Fall Meeting To Be Held Sept. 19-20

Fall meeting of the Steel Founders' Society of America will be held at the Homestead, Hot Springs, Va., Sept. 19-20. It will be the 58th annual fall session of the society.

Prior to opening of the meeting the board of directors will meet Saturday, Sept. 17, and a reception sponsored by National Malleable & Steel Castings Co. will be held Sunday evening.

Featured speakers on the program include Harold N. Bogart, manager of the Process Development Dept., Manufacturing Research Office, Ford Motor Co.; W. S. Clement, advertising manager, Dodge Steel Co.; and A. Hugh Forster, assistant director of advertising, promotion, and public relations, Armstrong Cork Co., Lancaster, Pa.

J. A. Bray, assistant general sales manager, Mackintosh - Hemphill Div., E. W. Bliss Co., Pittsburgh, and chairman of the SFSA Product and Market Development committee, will outline plans for the Fourth Product Development Contest to be conducted this year. B. P. Hammond, vice president of eastern casting sales, Foundry & Mill Machinery Group, Blaw-Knox Co., Pittsburgh, will review the industry's history and performance and set the theme for the steel casting industry's centennial observance, which will be held in 1961.

Tentative Program follows:

Monday, Sept. 19

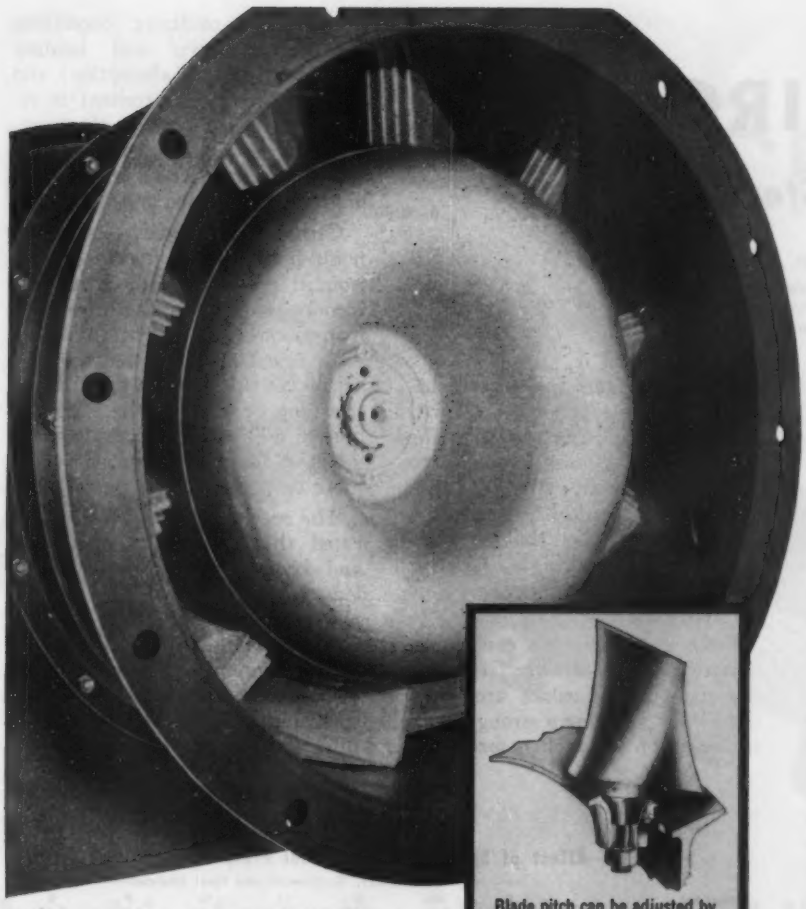
8:30 a.m.—Registration
9:30 a.m.—Management Session, President W. H. Moriarty, first vice president and group executive, National Malleable & Steel Castings Co., Cleveland, presiding: "Competition Sharpens Casting Perspective," Harold N. Bogart, Ford Motor Co., Dearborn, Mich. "Product Development Contest," J. A. Bray, Mackintosh-Hemphill Div., E. W. Bliss Co., Pittsburgh, and chairman, SFSA Product and Market Development Committee. "Steel Castings—The Product Without a Voice," W. S. Clement, Dodge Steel Co., Philadelphia
8 p.m.—Banquet and Dinner Dance

Tuesday, Sept. 20

9 a.m.—Registration
9:30 a.m.—Film—"Horizons North"
10 a.m.—Management Session: "Now Is the Time . . . " A. Hugh Forster, Armstrong Cork Co., Lancaster, Pa. Remarks of Counsel, Chauncey Belknap. "The First Century S. C." by B. P. Hammond, Foundry & Mill Machinery Group, Blaw-nox Co., Pittsburgh. Address, Dr. Howard Barton, Atomic Energy Commission
12 noon—Adjournment

Freight Car Orders Drop

American Railway Car Institute reports that 6042 new freight cars were delivered in June, 1960, compared with 5931 in May and 3950 in June, 1959. June, 1960, orders for new freight cars amounted to 321 compared with 2,234 for May and 8,054 for June, 1959.



Multiple exposure shows fan blades through the full range of pitch changes.

Blade pitch can be adjusted by loosening one nut, resetting the blade to desired position on calibrated scale, and retightening the nut.

Joy Design Means:

MINIMUM POWER CONSUMPTION WITH VARIABLE FAN OUTPUT

Blade pitch on Joy Axivane® Fans can be adjusted easily. This means that the volumetric output of Joy fans can be varied by as much as ± 20% without any sacrifice of fan efficiency, and therefore with minimum power consumption. And with no efficiency losses such as are encountered with dampers and variable inlet vanes. (Where efficiency losses may be tolerated, the volumetric output may be changed by as much as 400%.)

Even at full load, Joy Axivane Fans are more efficient than propeller, tubeaxial and centrifugal fans. The direct drive achieved by mounting the motors inside the fan housings eliminates drive losses, and the vane-axial design gives maximum aerodynamic efficiency. Mounting the motors in the housings also makes the Joy Axivane Fans more compact, and less costly to install.

Fans available range from types which weigh as little as a pound and have a diameter of a few inches, up to some which weigh tons and have diameters up to twelve feet. If you need spot cooling, area ventilation, or any movement of air, Joy can supply the most efficient answer.

For complete information, write for Bulletin 1278-13.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Circle 638 on Page 55

SPONGE IRON USE

In Production of Steel Castings

By J. R. SMALL
Chief Metallurgist
Stanley Foundries Inc.
Huntington Park, Calif.

● SPONGE IRON has been adopted as a melting stock in our induction foundry, which produces 300 and 400 series stainless steels, 4300 series, 17-4PH, and AM 355 steels. These grades are made to meet Aeronautical Materials Specifications. Heats of 900 lb are melted in a low-frequency induction furnace lined with a basic refractory.

When we became aware more than a year ago that sponge iron, produced especially for the melting of high-grade steels, would be available locally, we obtained some for experimentation.

This sponge iron is produced in Riverton, N. J., by a subsidiary of a Swedish company which has pioneered production of sintered iron from ore. The sponge iron we use consists of cylindrical briquets with diameters of 3½ or 2¾ in. and heights of 2½ or 2 in., respectively. The larger briquet weighs approximately 4 lb and the smaller one about 2½ lb. Density is 4.5 grams per cc, making it about 60 per cent as heavy as steel.

Starts with Ore — Briefly, the processing of sponge iron begins as crushed iron ore is admixed with carbon and powdered lime. The mixture is sintered in a kiln at 1000° C to produce a sponge-like mass of approximately 94 per cent metallic iron with 0.17 per cent carbon and the balance metallic oxides. Sulfur and phosphorus are held to low levels. The material then is crushed, purified, and compacted into briquets.

Following is a typical analysis furnished by the manufacturer: Total iron 97.6 per cent; oxides 1.9 per cent; carbon 0.17 per cent; sulfur 0.017 per cent; phosphorus 0.007 per cent; and manganese 0.05 per cent.

Our first experience with sponge iron was in making 303 stainless steel. This grade was selected because of the higher carbon allowed compared with other grades in the series. Table I shows a comparison of chemical compositions of two heats nearly identical in charge and alloy content except that one contained carbon steel plate, the other sponge iron. Both heats used 66 per cent return scrap in the charge.

From these data two conclusions tentatively were drawn: 1) That the sponge iron oxides are active chemically, exerting a strong oxidizing effect on the molten metal (we believe that oxidizing conditions during melt-down and holding minimize hydrogen absorption) and 2) that the carbon content is reduced materially, due to the interaction of oxides and carbon while the sponge iron (which was charged first) is being heated and/or melted.

Carbon Consumed — At this point, it was decided that the sponge iron, if properly charged into the furnace, would consume nearly all its own carbon by internal reaction. Also, it was apparent that the final silicon content must be raised by either one or both of the following means: Adding less mill scale to cut down oxidation of silicon, or adding more original silicon.

The previous results further indicated that control of manganese and chromium would not be a problem. Consequently, it was decided to try producing an extra-low carbon 316 stainless steel with a specified maximum 0.03 per cent carbon. Table II shows percentages of sponge iron and mill scale used with this heat, total chemical contents

TABLE I—Effect of Sponge Iron vs. Steel Plate on Chemistry

	Chemistry, % (Charged and Final Analyses)						
Heat No.	C	Mn	Si	Cr	Se	P	S
1 as charged	0.08	0.86	1.07	20.4	0.44	0.02	0.02
2 as charged	0.06	0.80	1.08	20.2	0.42	0.02	0.02
1 final (ladle)	0.02	0.58	0.63	19.7	0.34	0.015	0.015
2 final (ladle)	0.02	0.53	0.24	19.3	0.36	0.015	0.015

Heat No. 1—20.3 per cent steel plate, 1.7 per cent scale. Heat No. 2—20.3 per cent sponge iron, 1.7 per cent scale.

TABLE II—Chemistry for 316 Stainless Steel Heat

		Chemistry of Total Charge, %							
Materials	%	C	Mn	Si	P	S	Cr	Ni	Mo
Return scrap	66.0	0.02	0.46	0.53	0.011	0.011	12.6	6.8	1.88
Sponge iron	18.0	0.03	...	...	0.001	0.003	...	...	...
Mill scale	1.0	...	...	...	...	...	...	...	...
Balance	15.8	0.002	0.40	0.73	tr.	tr.	7.2	3.6	1.23
Total	100.8	0.052	0.86	1.26	0.012	0.014	19.8	10.4	3.11
Ladle analysis	...	0.03	0.67	0.88	0.016	0.016	19.3	10.2	3.0

TABLE III—Chemistry for a 347 Stainless Steel Heat

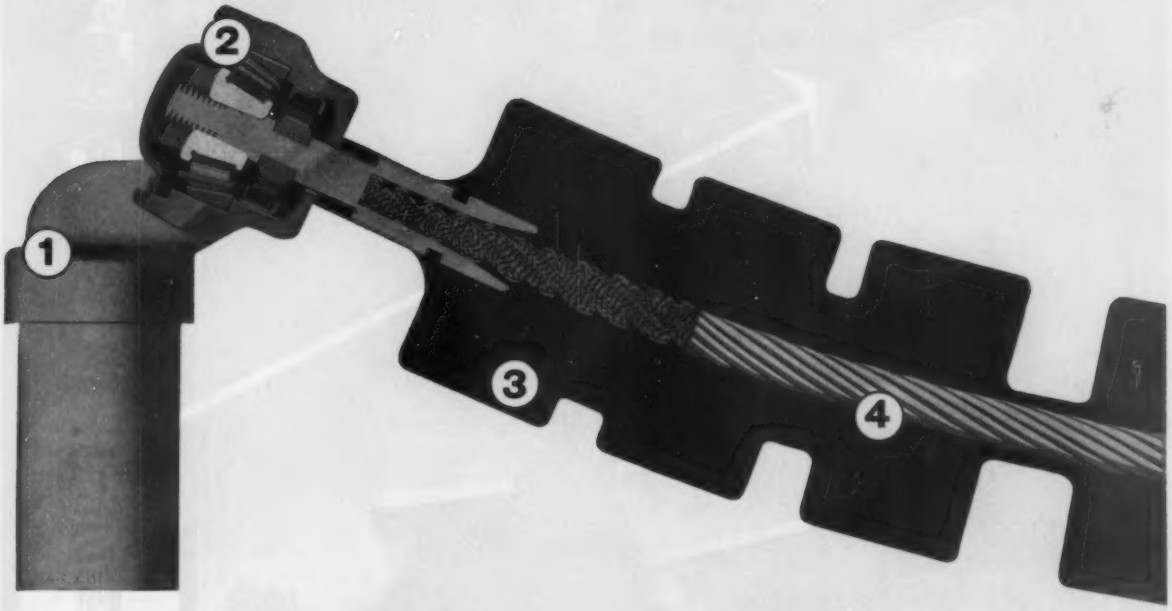
		Chemistry of Total Charge, %							
Materials	%	C	Mn	Si	P	S	Cr	Ni	Cb
Return scrap	66.0	0.026	0.56	0.59	0.011	0.011	12.6	6.4	0.43
Sponge iron	20.0	0.034	...	...	0.001	0.003	...	...	...
Mill scale	0.0	...	...	...	...	...	...	...	...
Balance	14.6	0.002	0.51	0.53	tr.	tr.	7.2	3.4	0.33
Total	100.6	0.062	1.07	1.12	0.012	0.014	19.8	9.8	0.76
Ladle test	...	0.04	0.65	0.70	0.016	0.018	19.5	9.8	0.56

TABLE IV—Log of Chemistry of Modified 4340 Heat

	Typical Chemistry, %					
Operation	C	Mn	Si	Ni	Cr	Mo
Cold charge	0.53	0.32	0.03	2.1	....	0.70
While melting	0.15	0.01	0.27	...	....	....
Subtotal	0.68	0.33	0.30	2.1	....	0.70
Carbon pref.	(0.14)					
Refining, added	0.30	0.49	1.67	...	0.80(a)	....
Total added	0.98	0.82	1.97	2.1	0.80(a)	0.70
Analysis:						
Before degas	0.38	0.64	1.76	2.0	1.05(a)	0.71
After degas (ladle)	0.39(b)	0.60	1.60	2.1	1.00	0.70

(a)—0.80 per cent charged to obtain 1.00 desired finish, due to preceding heat being 347 stainless steel. (b)—0.04 carbon added to furnace after vacuum degassing.

SIMPLICITY IS THE SECRET...



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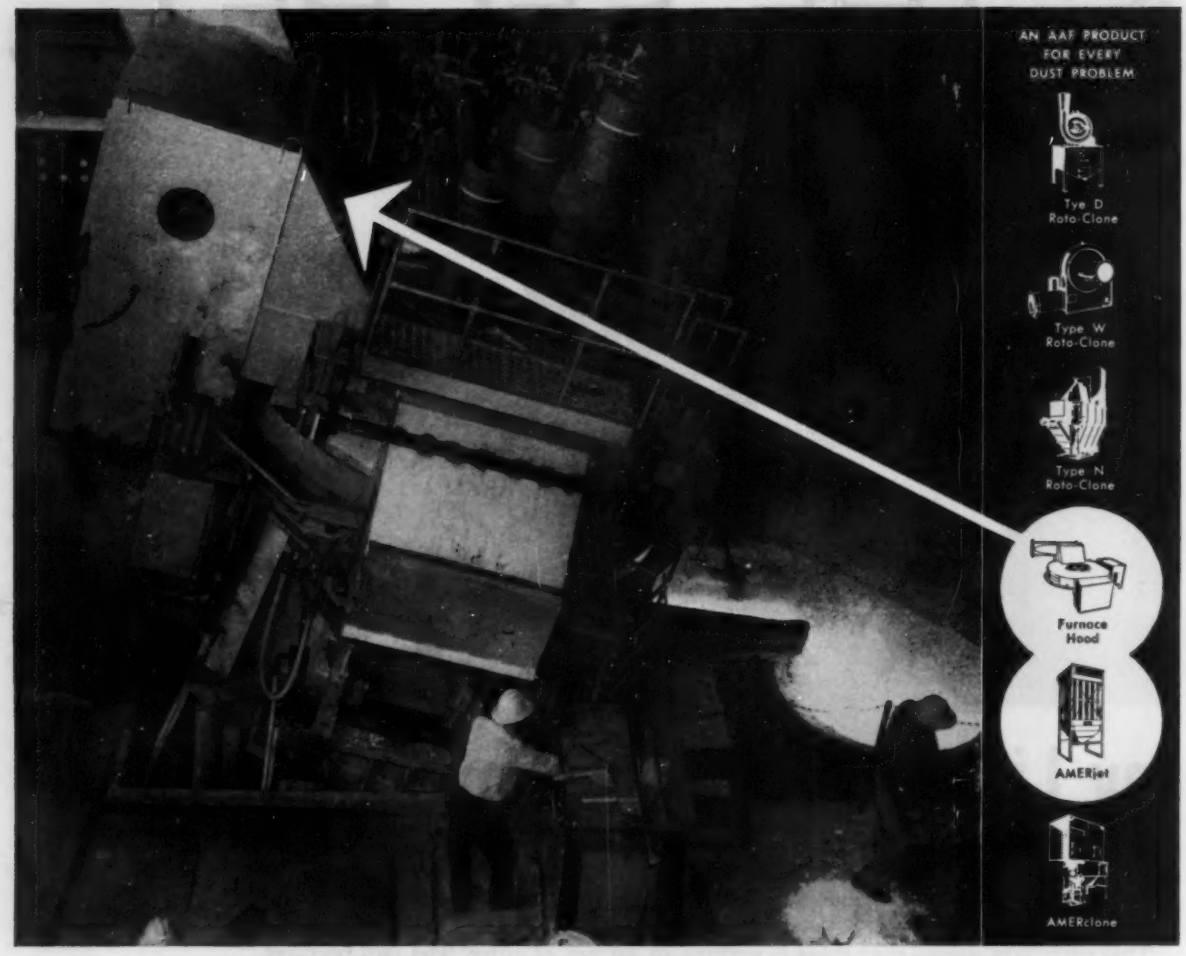
FURNACE FUMES



AAF "team" confines and collects electric melting furnace fumes

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AAF American Air Filter

BETTER AIR IS OUR BUSINESS

Circle 640 on Page 55

for all materials charged or added, and final analysis of samples from the ladle. Again, 66 per cent return scrap was used.

A preliminary test for carbon was run before tapping this heat. On later heats, vacuum degassing was used to insure a carbon level between 0.018 to 0.03 per cent. This is done particularly when return scrap is contaminated by arc-air cutoff.

As each new heat was melted, we used less mill scale. Omitting the scale entirely and using a 66 per cent return scrap to get 347 stainless steel seemed to be the next logical step. The results of this operation are shown in Table III. Shortly after producing this third 300 series stainless, it was decided that sponge iron could be substituted for Armco iron in all grades which previously called for the latter.

The next trial with sponge iron involved an interesting experience. This consisted of producing a number of heats of modified 4340 steel for an aircraft manufacturer. The project called for meeting ultimate strength levels of 260,000 to 285,000 psi, with elongation levels of 3 to 7 per cent. Furthermore, the customer was somewhat rigid about any melting procedure variations, i.e., a melting process was required to be capable of repetition.

Less Hydrogen Pickup—Keeping favorable experiences with sponge iron in mind, we approached the aircraft manufacturer about the desirability of using sponge iron in making both the AM 355 and modified 4340 grades. We told our customer that because the material is rust-free, there is less chance of hydrogen pickup. Also, we pointed out that more consistent melt-down characteristics give better uniformity in the final composition of the steels.

Permission was granted for using sponge iron and a number of AM 355 and 4340 heats were made. The analyses and tensile properties of the AM 355 were uniform at the proper levels. With the modified 4340 heats, however, we ran into some melting control difficulties. We were not allowed to use return scrap in the charge so the oxidizing impact of the sponge iron was not absorbed by the silicon and manganese present in the grades previously discussed. Even though ferromanganese and ferrosilicon were added during melt-down, a violent oxidizing condition persisted and an excessive carbon loss resulted in the 4340 grade.

We were able to adjust the carbon content in the 4340 steel so that the five heats had consistent analyses, but only by using a charging practice not to be recommended. This is because constant adjustment of the composition, based on visual observations, was required. The data in Table IV tell the story.

Once we had worked out this practice of making a 4340 steel with preliminary carbon contents of 0.14 to 0.164 per cent, we had surprisingly little trouble with process duplication. We found, however, that no carbon should be added with the cold charge. Rather, it is best to deoxidize with about 0.40 per cent silicon plus 0.30 per cent manganese after melt-down, and then feed in the pig iron.

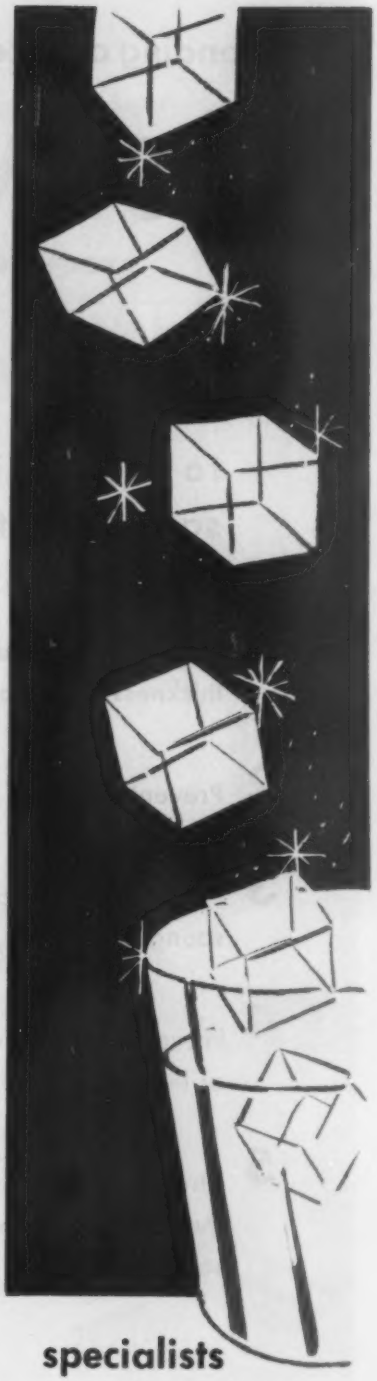
Advantages—From our experience, we would summarize the usefulness of sponge iron melting stock as follows: Physically, it seems to be nearly perfect for handling and there is no bridging during melt-down. In addition, it is clean and rustfree. Pricewise, it is economical. Chemically, it results in less than 0.03 per cent carbon (if charged first) and it will eliminate considerable silicon in return scrap. Also, it is quite low in sulfur and phosphorus. Metallurgically, it is a desirable material to use with high-grade, low-carbon, stainless steels, and should be valuable in melting mild alloy, high-strength grades of steel if it is handled properly.

Editor's Note: This paper was presented by the author in Los Angeles at a Technical & Operating group meeting of the Steel Founders' Society of America.

SFSA Issues Directory

Steel Founders' Society of America has published a new pocket directory of steel foundries in the U. S. A., Canada, and Mexico. It lists all North American steel foundries and their officers and directors, plus the officers, directors, and committees of the society.

The directory is 3¼ by 5 in. and sells for $3 per volume. It can be obtained from the society at 606 Terminal Tower, Cleveland 13, Ohio.


specialists
in taking off
the Heat
SEE NEXT PAGE . . .

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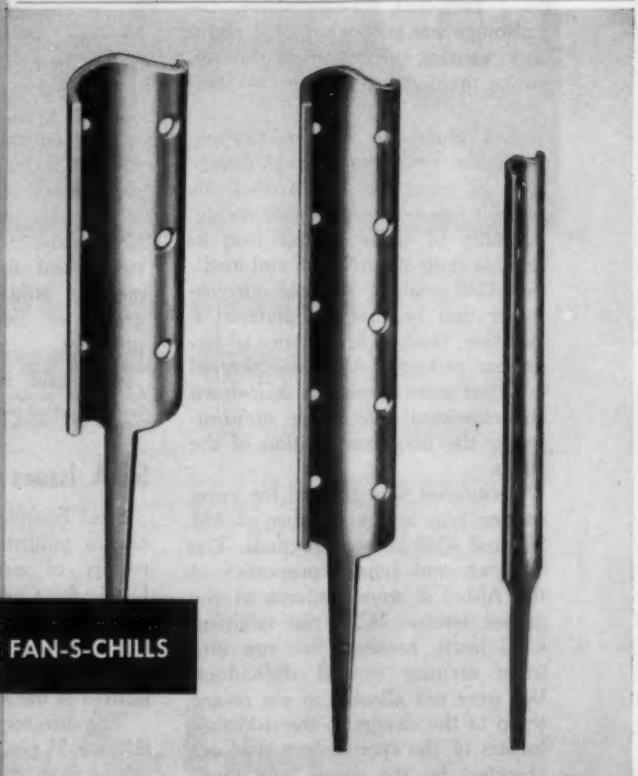

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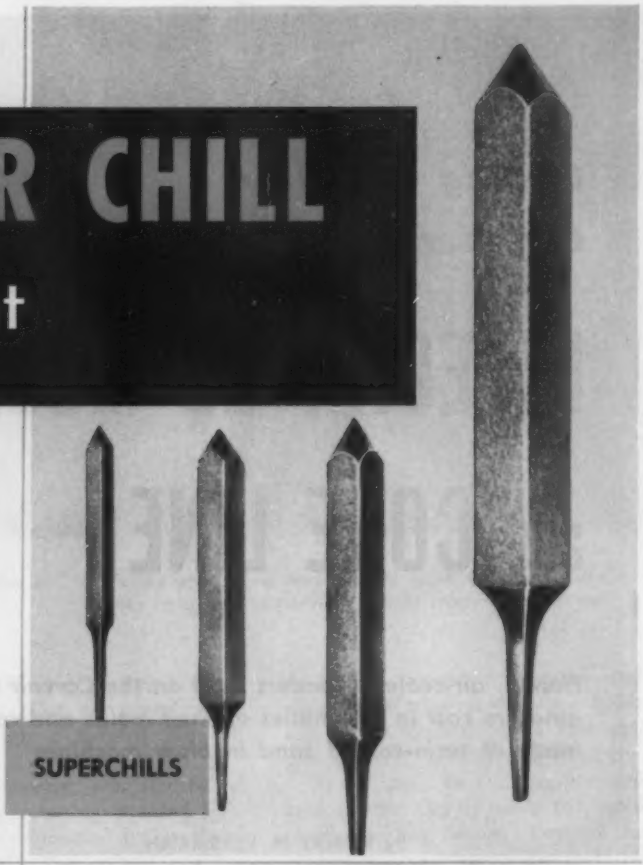

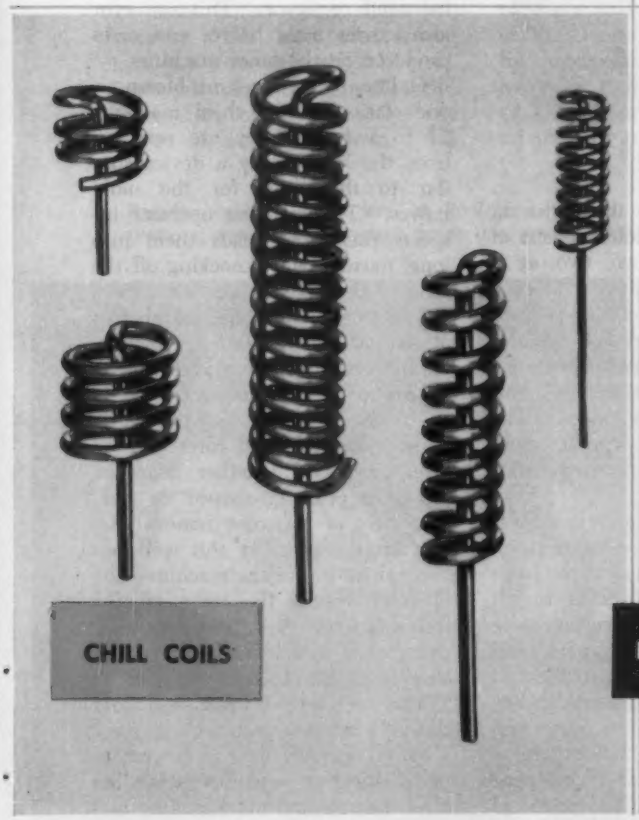

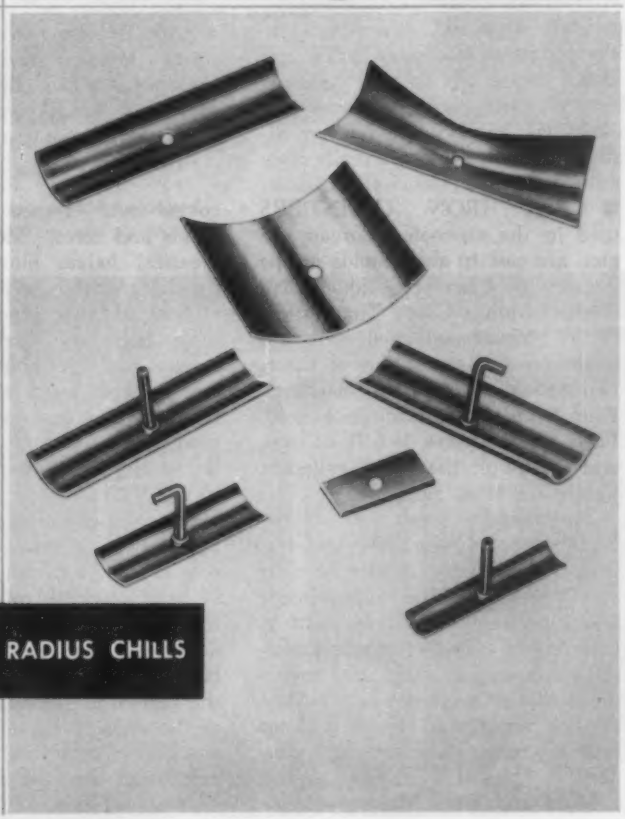

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Casting Gray Iron Cylinders on . . .

INTEGRATED MOLD and CORE LINE

Finned, air-cooled cylinders used on the Corvair engine are cast in assemblies of shell molds and cores made of resin-coated sand in blow machines

By ROBERT H. HERRMANN
Associate Editor

Worker inserts pin cores in mold halves. They form bolt holes in the cylinders

● GRAY IRON CYLINDERS used in the air-cooled Corvair engine are cast in shell molds at the foundry of Chevrolet Motor Div., General Motors Corp., Tonawanda, N. Y. Molds and shell cores are made on the same line of three, two-station shuttle blow machines. Four cylinders are made in a mold. Each mold receives 41.6 lb of iron, and each of the four cylinders weighs 6.9 lb as shipped.

The foundry scrap rate at the beginning of June, 1960, was less than a third what it had been in October, 1959. The improvement is due primarily to improvement in handling of cylinders during shakeout, cleaning, packing, and movement to the machine shop. Most of the scrap had resulted from broken cooling fins on the cylinders.

Mold and Core Making—Resin-coated sand is used in producing molds and cores. Molds consist of identical halves blown two at a time in a double cavity box at each station of two machines. Each mold half has four half-cylinder cavities and eight holes for pin cores which will form assembly bolt holes in the cast cylinders. The production cycle for two mold halves is a little less than one minute.

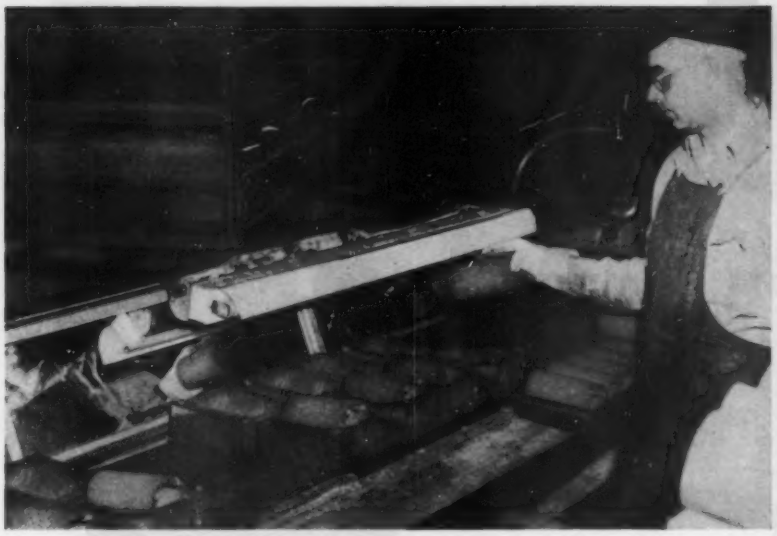
Near the end of the cycle a four-finger, air cylinder-powered shell removal device mounted at the front of each machine moves in to lift the two mold halves, resting face down, off the ejector pins and bring them out of the machine. As the carrier moves out, spray heads at the ends of the arms spray top and bottom mold box halves with a mixture of one part of 35 per cent silicone solution to 20 parts of water. Also, the blow stubs on the backs of the mold halves are knocked off by a bar mounted on the mold blowing machine.

The machine operator inspects the mold halves and puts them on a shelf hanger suspended from a monorail conveyor. This conveyor also carries mold halves and cores produced on the other machines.

Hollow barrel cores are blown on one station of the third machine, 24 to a box. They are removed from the lift pins by a device similar to that used for the mold halves. The machine operator inspects them and loads them into long, narrow pans, knocking off the blow stubs as he does so. Pans full of cores are loaded to shelves of the cooling conveyor.

Pin cores are blown vertically in 24 groups of four in one box on the other station of the third machine. The four pin cores in each group are held together near the top by a plus-sign-shaped tie web. The bars of the core removal device lift the cores by this web and carry them out of the machine. The operator breaks the cores off the web and loads them into long, narrow trays which are placed on shelves of the cooling conveyor.

The conveyor rides up and through an overhead cooling shed. Twenty minutes later it lowers to travel along an assembly bench behind the core and mold making ma-



Mirror along the conveyor belt aids workman in the proper setting of barrel cores in the mold

Molds are closed and slid off table to holding device in a bail suspended from a monorail conveyor

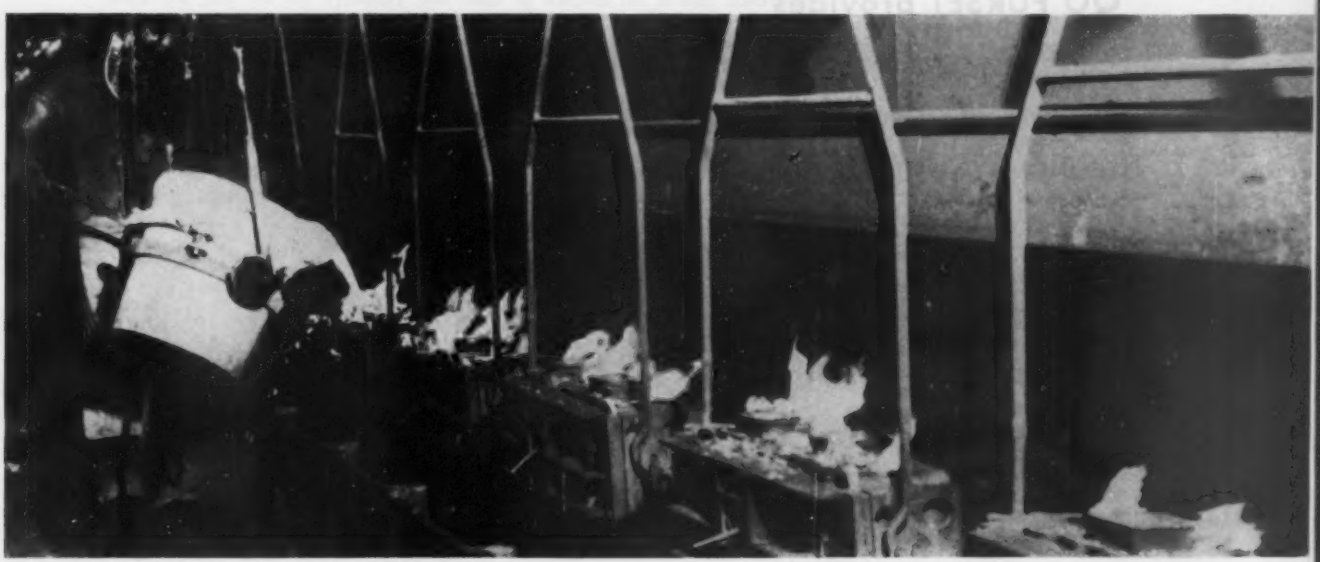
chines. Workers unload mold halves, pin cores, and barrel cores. Most of these components are used immediately; others are stored temporarily as a buffer to insure continuous production of molds.

Mold Assembly—A worker books two mold halves on a slider belt conveyor. The next man inserts eight pin cores in each half mold. The next man, using a flat file, drives the cores in tightly and knocks off protruding ends. He also opens the mold, laying the two halves flat. The conveyor carries them through a hooded blow-off station.

Then a worker sets the barrel cores. Proper setting is aided by a rectangular depression in the head of the core. The correct position of the depression can be observed by the worker in a mirror opposite his work station along the conveyor. The mold halves then come off the belt to a metal table where a worker closes each mold and slides it off the table into a holding device mounted in a bail suspended from a monorail conveyor.

Next, an air-cylinder-powered core pusher tightly seats the mold in the holding device. Beyond the pusher a worker turns the mold 90 degrees to place the sprue openings up. The sprues are formed at the parting line of the mold halves. Movement of a lever locks the mold in vertical position and actuates a cam clamping device to support the sides of the mold. The same work-

Regular cylinder block iron at 2640°F is poured into molds conveyed along a vent hood. Poured molds are carried through a cooling tunnel



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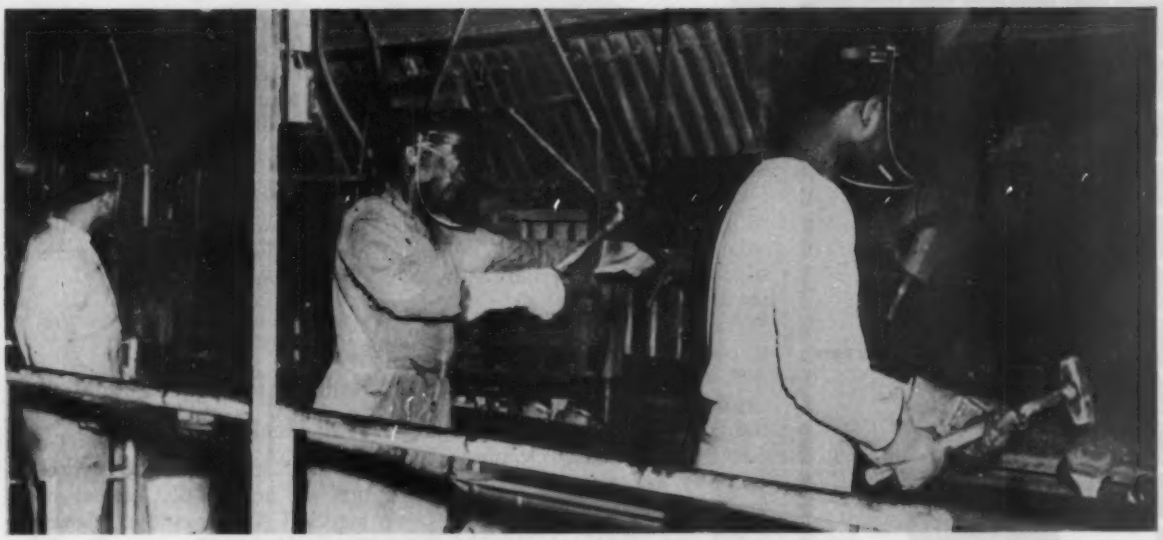


At shakeout, castings and molds are pushed out of the mold holders, sprues are broken off, and the cast cylinders are hooked to conveyor trays

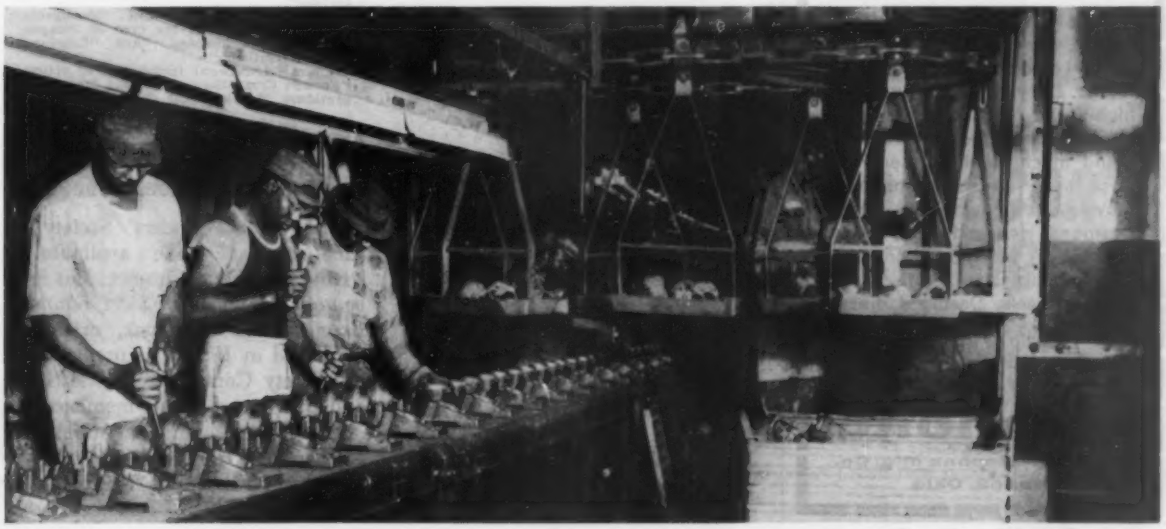
er applies paste to pouring basins and sets one over each of the two sprues on a mold. One sprue feeds two cylinders.

Regular cylinder block iron used in the rest of the foundry is poured at 2640° F from hand-manipulated ladles into molds along a vented hood. The mold conveyor then travels up to a cooling tunnel for 36 minutes before returning to floor level over a vibrating, slotted pan conveyor. The first of three men along the conveyor hooks a hinged safety bar out of the way while an air ram drives castings and mold down and out of the mold holder. The safety bar is designed to prevent the mold or castings from falling out of the holder between pouring and shakeout stations.

The second man hits the sprues with a sledge, breaking them off. Sprues and sand fall through a slot in the conveyor pan and down a chute to a breaker barrel from which they are segregated and salvaged. The third man hooks the cylinders to trays on monorail conveyor hangers.

Castings Cleaning—In the cleaning room, the castings are loaded from the conveyor to spindles on revolving holders of a blast cabinet conveyor. After shot blasting, the block ends of the cylinders are ground on a table grinder. The cylinders then are set in fixtures on a slat conveyor, and a worker grinds the head ends of the cyl-

Castings arriving at cleaning room, top right, are unloaded to blast cabinet for cleaning. Then the cylinder ends are ground and flash is removed from the fins as the cylinders are held in fixtures on a slat conveyor



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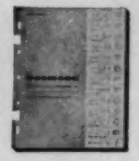

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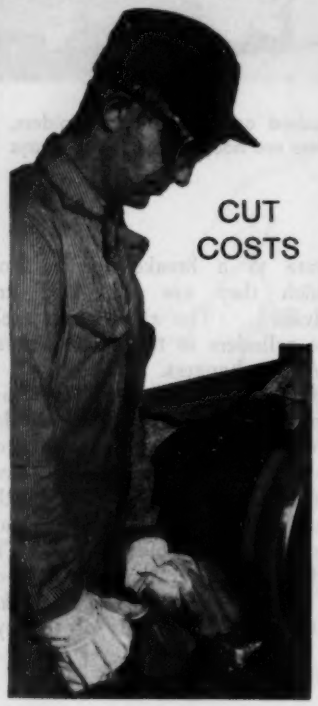
DRESS SNAGGING WHEELS:



CUT COSTS

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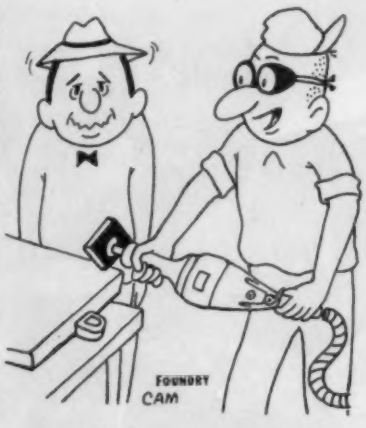
Circle 643 on Page 55

inders with a cup wheel on a portable air grinder.

An inspector checks the castings and turns them 90 degrees in the fixtures so that succeeding workers, using chisels and hammers, can chip parting line flash from between the cooling fins. Cylinders with excessive flash are placed in a six-station rotary grinding machine which automatically grinds between the fins and ejects the casting. Workers place them back in the fixtures on the slat conveyor.

Workers with portable air tools clean the flash from bolt holes, locating points, and from any other casting area requiring cleaning. The cylinders are given a final visual inspection, and the bolt holes are gaged. Finished cylinders are packed in skid boxes with a cardboard liner between layers and fork-trucked to an adjacent machine shop.

Sand Reclamation — All used, resin-bonded sand is reclaimed. Broken molds and cores, blow stubs, and shakeout sand fall to an oscillating pan conveyor in the basement for movement to a breaker barrel. A belt conveyor carries sand from the barrel to a bucket elevator which empties to either of two chutes; one feeds a storage silo, the other supplies a screw feeder for a calciner. Temperature in the 6-ft-diam, 60-ft-long rotating calciner is 1600° F. Residual resin and other carbonaceous material is burned off the sand, which flows through the unit at an adjustable rate of 2 to 7 tons an hour.



"What am I gonna do? I'm gonna grind a square groove in this part, that's what"

Sand flows out the calciner to a similarly rotating cooler underneath the calciner. It emerges at a temperature no higher than 220° F. The reclaimed sand is raised by bucket elevator for deposit in a storage silo. New AFS 89 clay-free bank sand is introduced into the system through the cooler, thence to the same storage silo containing the reclaimed sand.

● For an extra copy of this article, until supply is exhausted, use card on Page 55

National Foundry Association Will Meet in Chicago

The National Foundry Association will hold its 61st annual meeting Sept. 22-23 at the Edgewater Beach Hotel, Chicago. Dr. John K. Langum, business economist, and Herman Menck, vice president, Harnischfeger Corp., will be the featured speakers.

Meeting sessions will deal with labor-management relations. The specific topics to be discussed have been determined by questionnaires sent to association members.

Thursday, Sept. 22

9 a.m.—Reports of the president and the executive secretary
10:30 a.m.—Concurrent sessions with participants divided into small groups of similar interests. Discussion leaders will be company negotiators
12:30 p.m.—Luncheon: "Short and Long-Term Business Prospects." John K. Langum, Business Economics Inc.
2:15 p.m.—Concurrent sessions
3:30 p.m.—Concurrent sessions covering Labor-Management subjects, conducted by experienced representatives from NFA member firms: "Preparing for Bargaining," "Management Rights," "Computing Cost of Fringes," and "Foreman Training in Labor Relations"
6:30 p.m.—President's Reception

Friday, Sept. 23

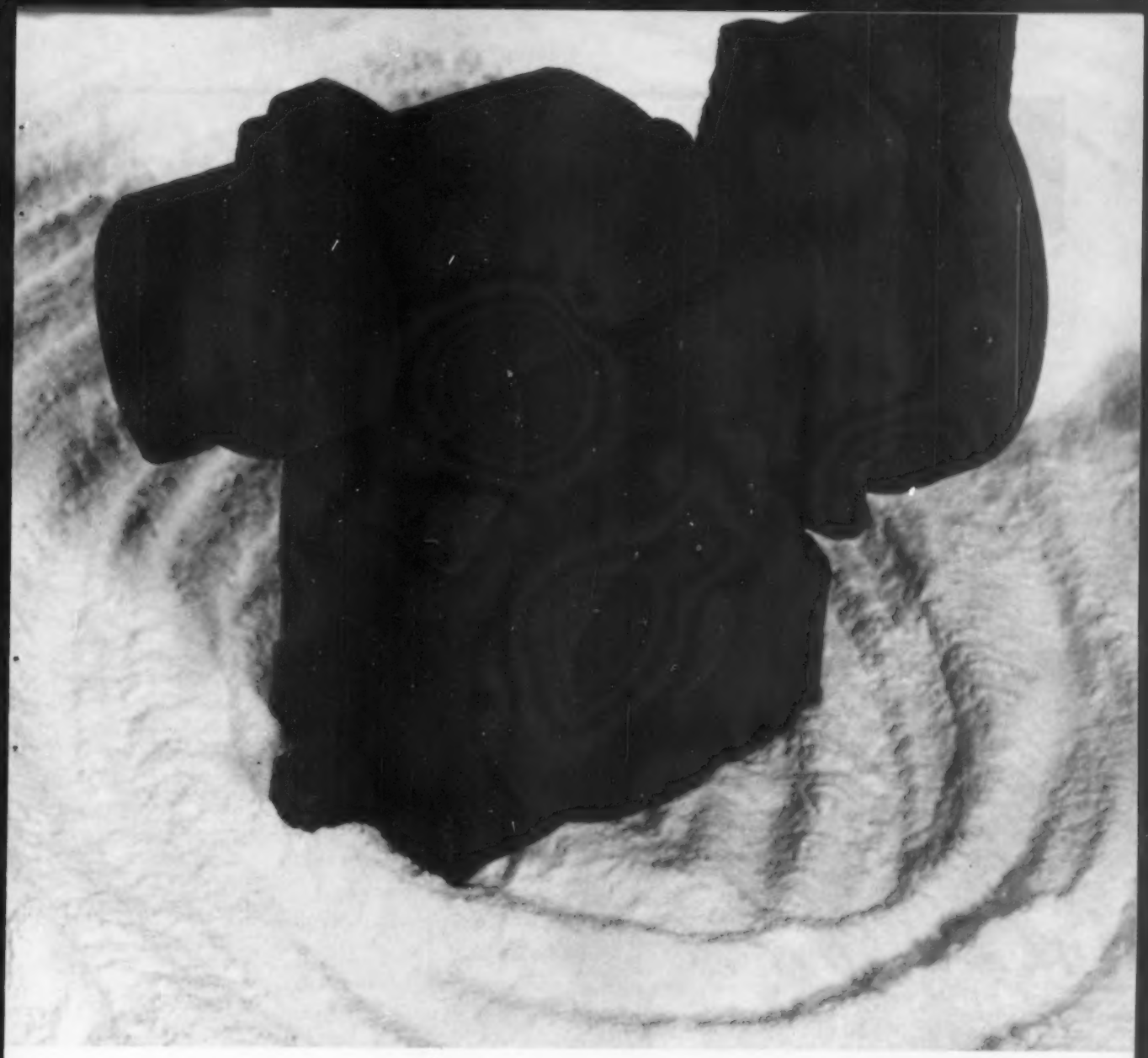
9 a.m.—Concurrent sessions by subject resume: "Preparing for Bargaining," "Foreman Training in Labor Relations," "Contract Negotiations," and "Grievances and Arbitration"
10:45 a.m.—Concurrent sessions: "Management Rights," "Computing the Cost of Fringes," "Contract Negotiations," and "Grievances and Arbitrations"
12:30 p.m.—Luncheon: Installation of officers. "Foreign Competition," Herman Menck, vice president, Harnischfeger Corp., Milwaukee

Accident Prevention Manual Is Revised by Steel Founders

The Steel Founders' Society of America has made available a second printing of the *Accident Prevention Manual for Steel Foundry Executives*. This book, originally published in 1956, was prepared by the Safety Committee of the SFSA and distributed to all members.

Copies of the manual are available for $4 from the society, 606 Terminal Tower, Cleveland 13, Ohio.

Circle 644 on Page 55→



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Circle 646 on Page 55

Foundry Developments

By EDWIN BREMER

Metallurgical Editor

Carbide Refractory

RECENT addition to the refractory field is a complex nitride-bonded silicon carbide developed by Norton Co., Worcester, Mass., and available under the tradename Crystolon 63. Material is reported to have high thermal conductivity; good corrosion resistance to fused salts such as cryolite; excellent abrasion resistance; good resistance to flame impingement. It is not wetted by aluminum, magnesium, zinc, lead, and other nonferrous metals; and it possesses a modulus of rupture of 7000 psi at 2280° F. Applications of the new silicon carbide refractory include reduction cell linings for aluminum production, bottom and wall lining for hearth furnaces for aluminum melting as well as tapping and slag hole blocks; pouring nozzles; induction furnace lining; and launders, etc., for molten metal transport. Also the refractory can be used for magnesium reduction and melting, zinc reduction, and in crucibles for nonferrous melting.

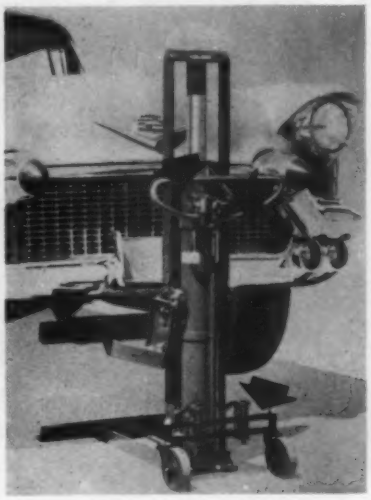
Lead Causes Trouble

ATTENTION again is directed to effect of small amounts of lead in heavy-section castings in an article, "The Harmful Effects of Lead in Grey Iron Castings," by E. R. Evans in the May issue of *BCIRA Journal* (Birmingham, England). It points out that small amounts of lead seriously reduce strength and may cause premature failure. Those problems appear to result from the lead promoting formation of spiky and Widmanstaetten graphite patterns.

Analytical procedures are not yet adequately established to permit specification of a maximum safe lead content in pig irons and similar melting stock. It is suggested, however, that foundrymen making heavy castings should exclude rigorously all materials such as leaded steel scrap, bearing metals, etc., from their furnace charges. In light castings, lead contamination can arise from remelting of vitreous enameled scrap. When excessive amounts are used, there is an increase in the incidence of cracking, but in moderate quantities little difficulty should be encountered.

Castings Save Money

MANUFACTURER of the heavy duty automobile jack shown in the accompanying illustration saved $21,000 on his first 4000 units after switching to malleable iron castings for three parts fabricated by other methods. Largest is the 16-in. swivel caster bar indicated by the arrow at the bottom. Cost of the malleable



casting ready for use is $1.02 as compared to $3.70 for the previous part. Pattern costs on it were paid out of savings before the 125th part was cast. The other two castings are the safety latch and catch located at positions indicated by the upper arrows. They saved the manufacturer over $1.40 each over the previous fabrications. Pattern costs for the units were amortized by the 240th part. Design change to castings was made by Northern Malleable Iron Co., St. Paul, Minn.

Uranium Uses

POTENTIAL uses of depleted uranium in the iron and steel industry are discussed by Battelle Memorial Institute metallurgists Vincent Barth and George Rengstorff in the July issue of *Battelle Technical Review*. Promise as an alloying element for tool steels is indicated by uranium's ability to form a stable carbide which does not dissolve in iron within its useful operating range. It also could be used as a scavenger for impurities in steels because of its ability to tie up nitrogen and to control the shape and melting point of sulfur inclusions when added after the usual deoxidation measures. It might be used as a spheroidizing agent in making ductile iron since it is a very strong sulfide former. Again it might be employed as an agent to strengthen metals by dispersion hardening since uranium oxides in a fine state of subdivision tend to remain suspended in the metal.

Hardens Magnesium

RESPONSE of magnesium-rare-earth alloys to age-hardening is markedly improved by the addition of 2 to 3 per cent silver according to "Improvement of the Age-Hardening Properties of Magnesium-Rare-Earth Alloys by Addition of Silver," an article by R. J. M. Payne and N. Bailey in the June, 1960 issue of the *Journal* of the Institute of Metals (London, England). Mechanical properties depend on the particular rare-earth mixture used. Mixtures improve properties in this order: Mischmetal, mischmetal plus thorium, and neodymium, according to the data obtained.

Zirconium is an indispensable constitutent of the alloys. One casting composition shows 2.5 per cent silver, 2.5 per cent neodymium, and 0.6 per cent zirconium with a minimum tensile strength of 34,720 psi, a proof stress at 0.1 per cent offset of 24,640 psi, and an elongation of 2 per cent. Another contains 2.5 per cent silver, 1.6 per cent neodymium, and 0.6 per cent zirconium with a minimum tensile of 34,720 psi, proof stress at 0.1 per cent offset of 22,400 psi, and elongation of 4 per cent.

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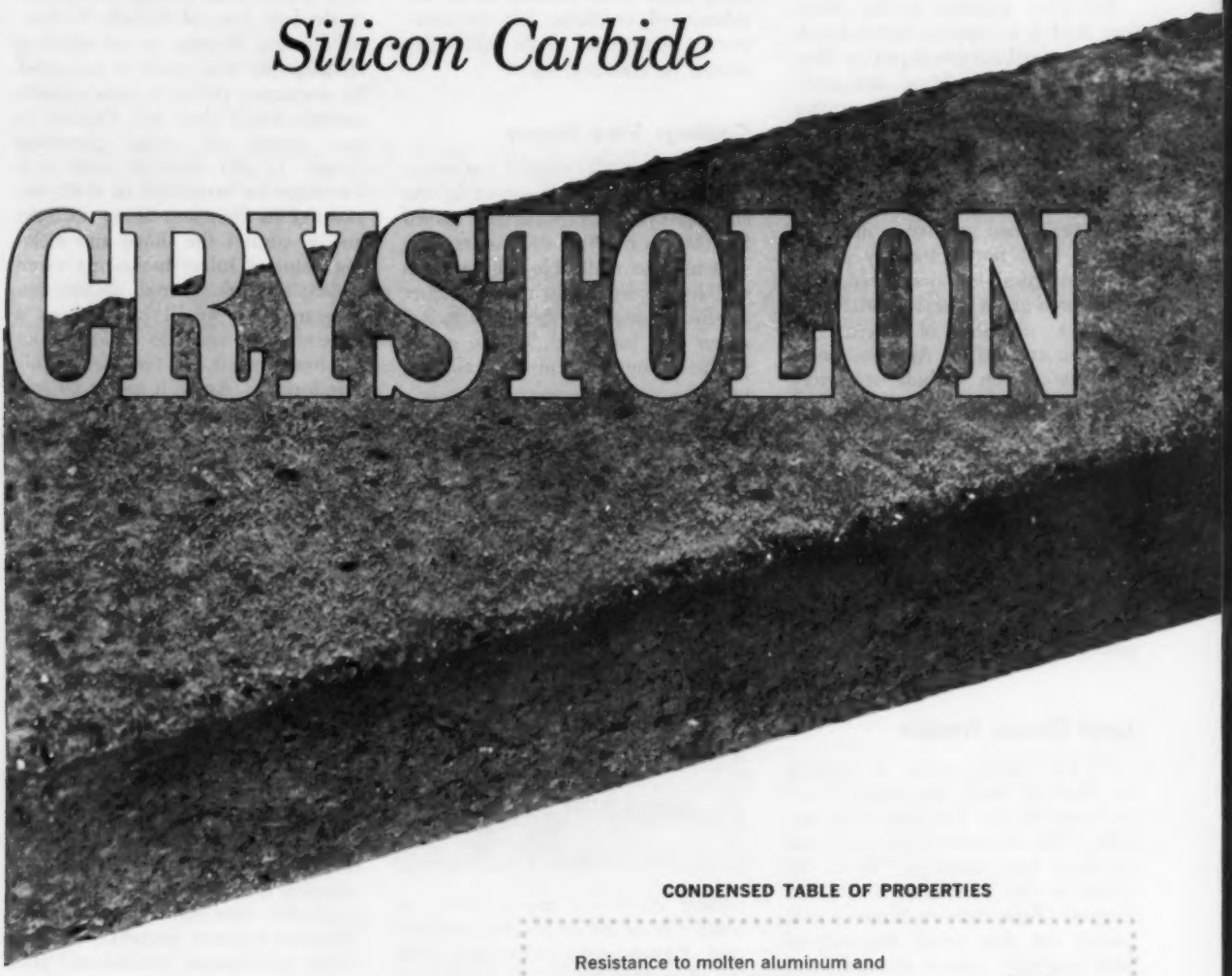

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Resistance to molten aluminum and molten cryolite at 1000°C.	Excellent
Fired Density	2.60 g/c.c.
Wear Resistance	Excellent
Oxidation Resistance	Excellent
Modulus of Rupture	
Room Temperature	6400 p.s.i.
1250°C.	7000 p.s.i.
1450°C.	3800 p.s.i.

Test procedures available on request.

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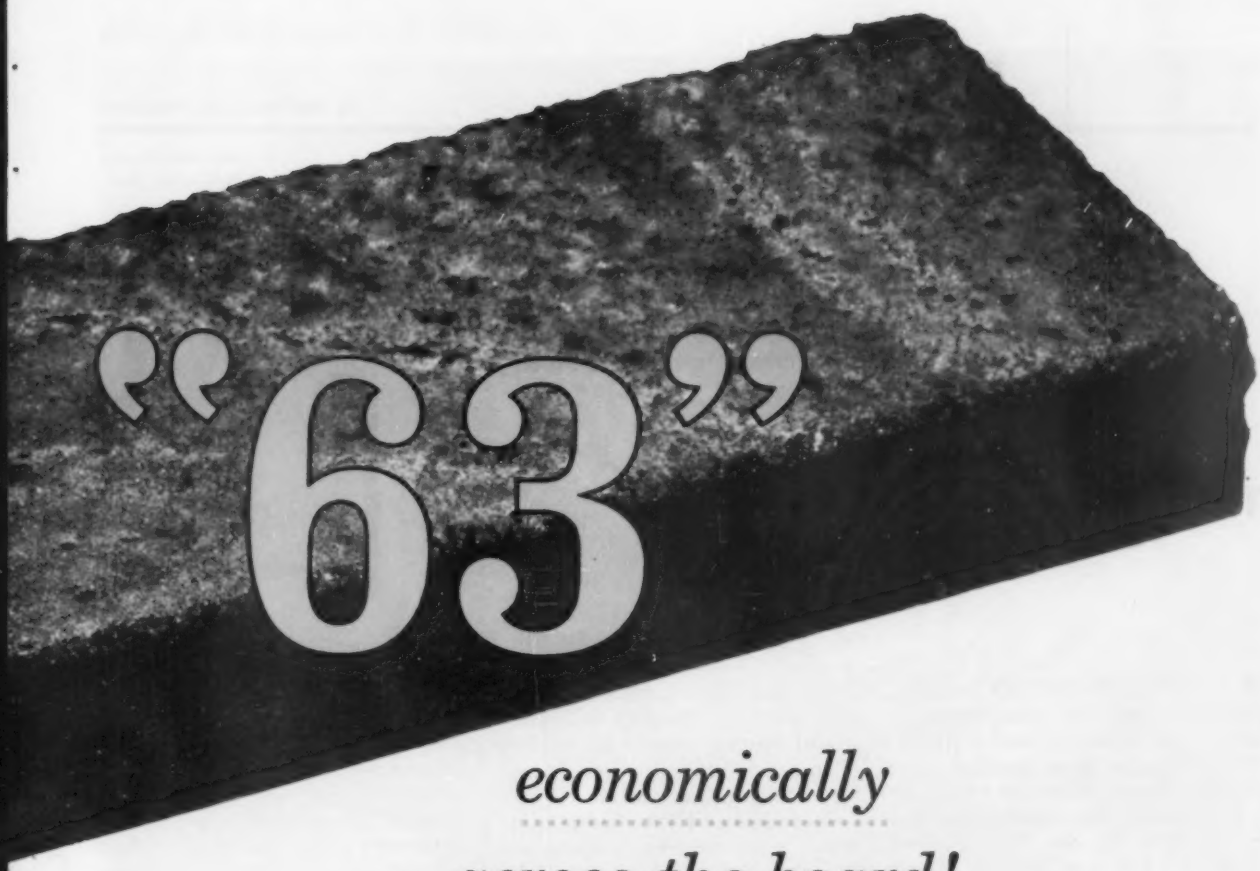

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Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"Seasoned foundrymen are knit together into a tighter, more exclusive clan than members of almost any other craft or profession"

The Foundry Fraternity

● A WELL SEASONED foundry consultant and very close friend of mine, Ted Linabury, and a friend of his, another good foundry consultant, dropped in on me the other night while I was working on the night shift in the Lee Hobby Foundry—and way behind schedule. I was glad to see them, although in a one man-foundry entertaining guests while carrying on production can be quite a problem.

Both insisted that I go right ahead with my work. Thanking them for their consideration, I insisted that I not only was glad they had come, but considered it an honor to have them drop in and wouldn't dream of having them cut their visit short just because I happened to be snowed under with work. They took me at my word and stayed until twelve-thirty. In spite of my inability to make my day rate with their help, we poured off and shook out all good ones.

The truth of the matter is that I enjoyed every minute of this impromptu get-together, for it gets downright lonesome shoveling away without anyone around who speaks the foundry lingo, someone you can brag to, argue with, and jokingly insult. As an amateur, I have noticed that one of the earmarks of a seasoned foundryman is an inclination to make smart cracks to a fellow foundryman.

For instance, this friend of Ted's, Bob Dalton, had no more than got into the place before he started rooting around in my box of sprues and gates for remelt and found three misruns of the castings I was running. He made any number of snide remarks, pointing out the obvious and elementary mistakes which no green apprentice would think of making.

Call to Order—I replied, "Looky here, Bob (No one could help calling him Bob right away), even among foundrymen, there are certain standards of six-year-old good manners which forbid snooping around for examples of humiliating scrap. I am calling these basic facts of life to your attention for your own good. You just can't go around on such short acquaintance doing what you did."

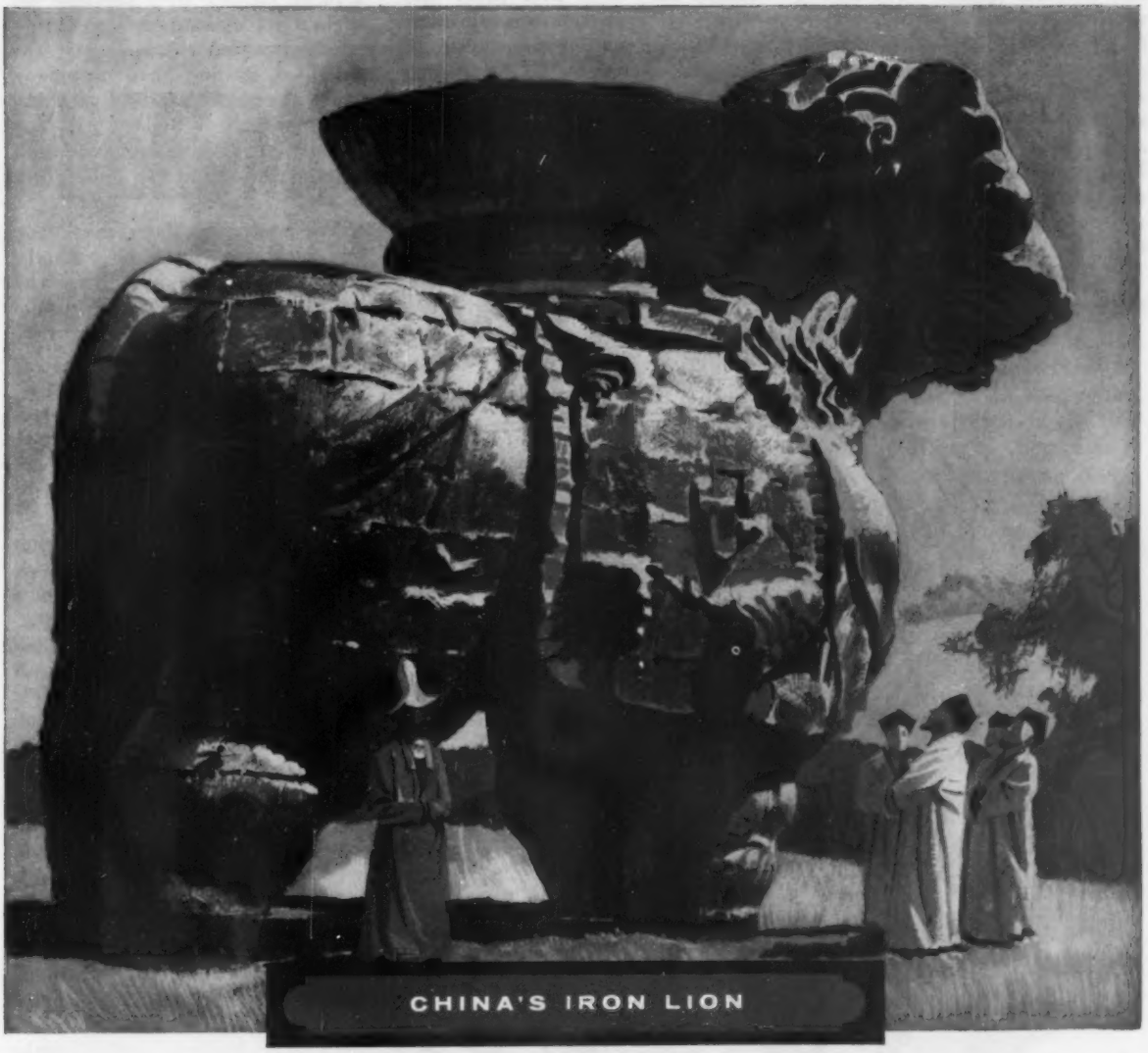
A member of the foundry fraternity

We all seemed to get a bang out of this horseplay and I particularly got a real lift, for it seemed to me that this banter indicated that I was considered a member of the foundry clan, maybe not in particularly good standing, but just over the amateur line.

The boys showed a keen interest in the Lee Air Pack diaphragm molding machine. Production came to a standstill as I stopped work to explain how it operated. This discussion led to talk of molding pressures, mold hardness, and synthetic and natural-bonded sands. The three of us ended up in the pattern shop, where we all sat down and went to town on our hunches, experiences, and beliefs, all of which culminated in a suggested outline of future research.

Concerning Cores—When I got back to work for awhile, the cores required on the job sparked another chain reaction of production interruption. Both Ted and Bob are experts in the field of core binders, and I'm a babe in the woods. Since I'd had one heck of a time, I led

Gray Iron Foundry Milestones—No. 2



CREATED in China in 935 A.D., the cast iron Lion illustrated above still stands as a tribute to the craftsmanship of the pioneering Chinese foundryman.

Iron was first cast in China about 700 B.C., and although the Chinese were not the first to produce the metal, they developed advanced founding techniques. Their box-bellows furnace, for example, was the most efficient melting implement of the era. And their discovery that the introduction of carbon significantly reduced the melting point of the iron, was a milestone in the history of founding.

Today, the progressive Gray Iron Industry contributes significantly to the nation's industrial growth by creating essential products which range in size from the smallest gear to the largest steel mill roll.

As a supplier of quality foundry coke and pig iron, Pittsburgh Coke & Chemical Company is proud to contribute to the continuing growth of the great Gray Iron Foundry Industry.

Reproductions of the "China's Iron Lion," suitable for framing, may be obtained without charge by writing to the Coke & Iron Division, Pittsburgh Coke & Chemical Company, Grant Building, Pittsburgh 19, Pennsylvania.

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Neville Pig Iron and Neville Coke for the Foundry Trade

Circle 648 on Page 55

the trio back into the pattern shop and onto our fannies. The subject was reviewed quickly, and greatly to my benefit. They got a kick out of the bond I was using for the delicate cores involved in the current job—liquid home laundry starch with a touch of kerosine—but by golly, it worked! They burst out laughing, but had to agree that my cores had turned out to be all they should be.

My homemade draw bench, the eight hard plaster coreboxes, and the homemade thermostatically controlled core oven were pried into with eagle eyes—not so many smart cracks—and with just a touch of general approval (all of which salved my old ego). My guests tagged along after me as I started the heat.

Both of them researched the furnace, blower, and gas control, and chuckled over the size of crucible, the small ingots made especially for the Lee Hobby Foundry, and the pyrometer.

While the metal melted, we had another pattern shop conclave on the subject of sand testing, during which I waxed eloquent and was delighted to find that my many years of research were of considerable interest. Besides, I was brought up to date on several new developments and on plans for more.

We poured off, later shook out, and luck was with me. All the castings were good—a surprising occurrence in view of the oscillation back and forth between visiting and working.

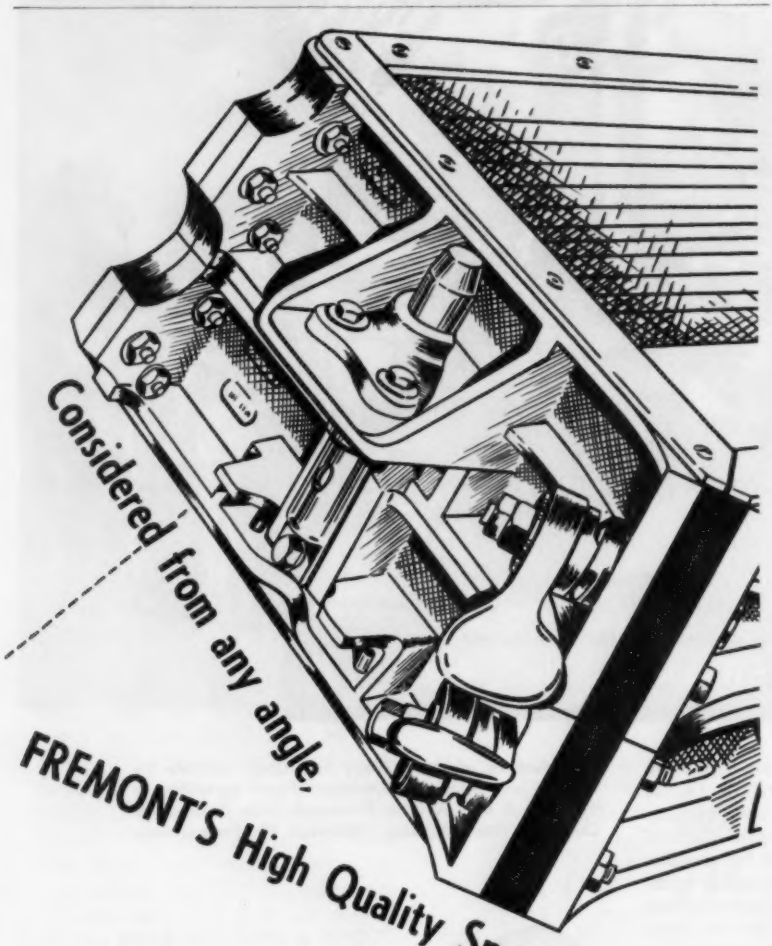
There is no question that we all had a good time, talking the language we could understand and enjoying the company of those dedicated to the casting craft and its progress.

The Foundry Clan — I haven't any statistics, but from my wide acquaintance among foundrymen all over the country and my interest in their careers throughout many years, I believe that seasoned foundrymen are knit together into a tighter and more exclusive clan than the members of almost any other craft or procession.

I should explain that when I say "exclusive" I don't mean an attitude of deliberate snootiness, but a result of the uniqueness of foundry practices in comparison with all other manufacture. I imagine that most of us find it difficult to get over the principles of cast metal practices to the average person, even one fairly well acquainted with most methods used to make things.

Maybe these differences account for that something about the foundry that keeps those who have made the grade pretty loyal to the craft, through thick and thin, with a certain hard-to-explain satisfaction in being acknowledged as a full-fledged member of the ancient order. I wish we could get this satisfaction of belonging over to young folks who would make good members.

P. S.—Thomas Latimer, a 17-year-old neighbor and a constant visitor to the Lee Hobby Foundry for the last seven years, stayed the other night, listening to every word, until the guests had gone. As he left, he said, "Oh boy, what an interesting night!"



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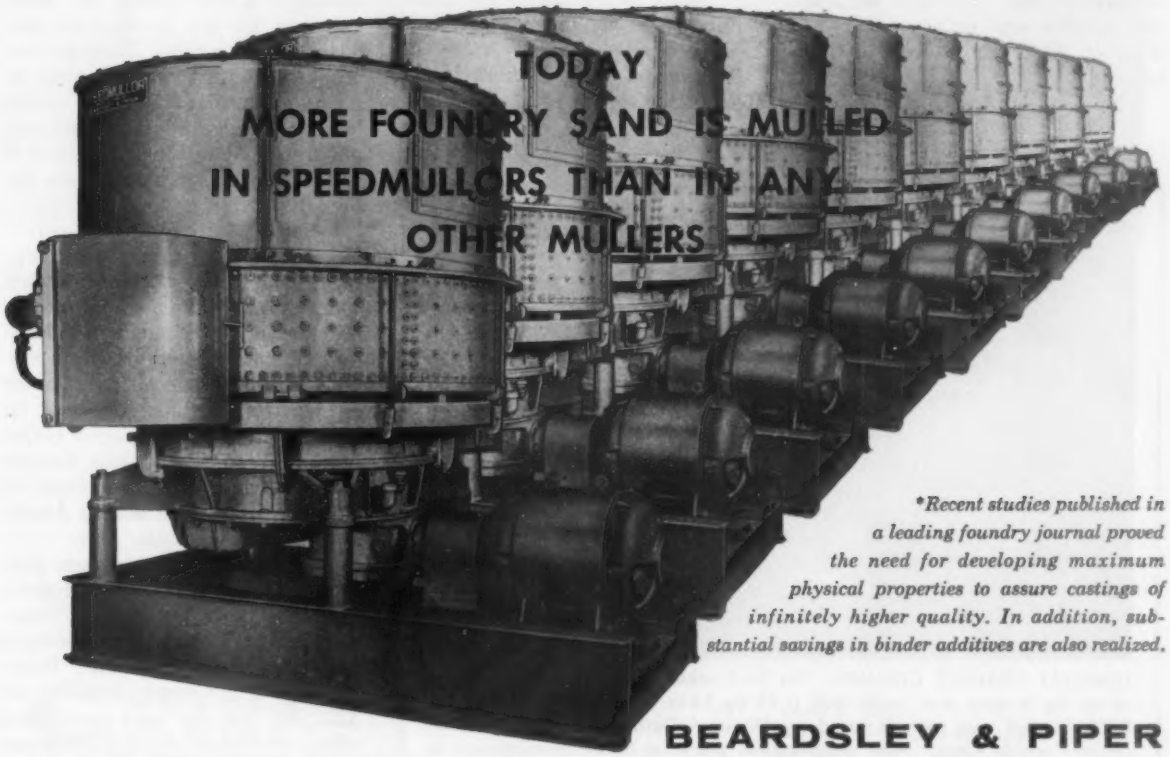

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Around the Country

NEWS REPORTS FROM

Detroit . . . Boston . . . Philadelphia . . . Chicago . . . Pittsburgh

Detroit— Of three new compact car engines known to be in production, one is gray iron and two are aluminum. GM's Pontiac Motor Div. Tempest will have a four-cylinder gray iron block mounted in the car at an angle of 45 degrees. Pontiac people speak of it as half of a V-8. The engine will develop about 125 hp.

Major parts for the engine are gray iron cast in green sand. Cores are made in a new machine operated in conjunction with the existing molding machine line. The core-making machine was developed by T. R. Schroeder, foundry superintendent, and his staff. It is said to blow the sand mix at 20 to 40-psi air pressure into a hot, no-vent corebox. Production claims are that the machine will make two assemblies of seven cores each in 7½ seconds.

The core binder is a new one developed at the GM Technical Center. In all probability it is a furfuryl alcohol-urea resin-special catalyst compound which produces a wet sand mix that cures in a hot box to form a solid core.

The V-8 engines in the Buick Special and the Oldsmobile F-85 are principally of aluminum. Blocks and heads are cast in permanent molds at the Defiance, Ohio, plant of GM's Central Foundry Div. The sand cores used to make these parts employ a new resin binder which is said to require a short oven bake. Cores made with furfuryl alcohol-urea resin binder may not be used in this permanent mold operation because that type of binder emits gas rapidly when broken down by the heat of molten metal. Adequate venting of the permanent molds may be a problem.

The use of an aluminum block, six-cylinder engine in the Rambler is almost a certainty. American Motors Corp. developed the engine in co-operation with Doehler-Jarvis Div., National Lead Co., where the castings are being produced.

LONGEST GRAPHITE COLUMN: This 30-ft column of graphite is reported to be the longest ever made with a 12 by 14-in. cross section. It weighs 3700 lb and was manufactured by National Carbon Co., a division of Union Carbide Corp. New metallurgical processes under development in various industries are requiring graphite stock in sizes this large, and special techniques were developed for producing them

Boston— Iron foundries are operating slightly above pre-vacation schedules, but not more than 5 per cent above in most instances. Backlogs are nonexistent, and orders for castings, under delivery pressure from consumers, are poured short of normal lead time. Some malleable shops are operating five days per week, but with reduced crews, averaging 60-65 per cent of capacity. Gray iron and nonferrous melts are several points below this rate.

Textile mill equipment shops are melting somewhat above the average, but all are mechanized and have large capacities. They are not farming out work; instead, most, to maintain current rate, are taking jobbing tonnage. Machine tool volume is slow, but thus far builders of plastics products equipment are doing fairly well.

Despite slow business, numerous foundries are installing new equipment for lower costs to meet intense competition. These programs are centered largely in automated cleaning equipment, sand handling systems, and, in some instances, more efficient furnaces for annealing. In addition to shops mentioned earlier in these reports, Plainville Casting Co., Plainville, Conn., revamped its cleaning department during August downtime for vacation.

Orders for castings to meet government contracts are up slightly. De Laval Steam Turbine Co., Trenton, N. J., booked three contracts for lube pumps from the Portsmouth, N. H., naval shipyard, for $220,086. For the navy purchasing office, Brooklyn, N. Y., Chapman Valve Co., Indian Orchard, Mass., will supply gate valves and a main condenser circulating system for

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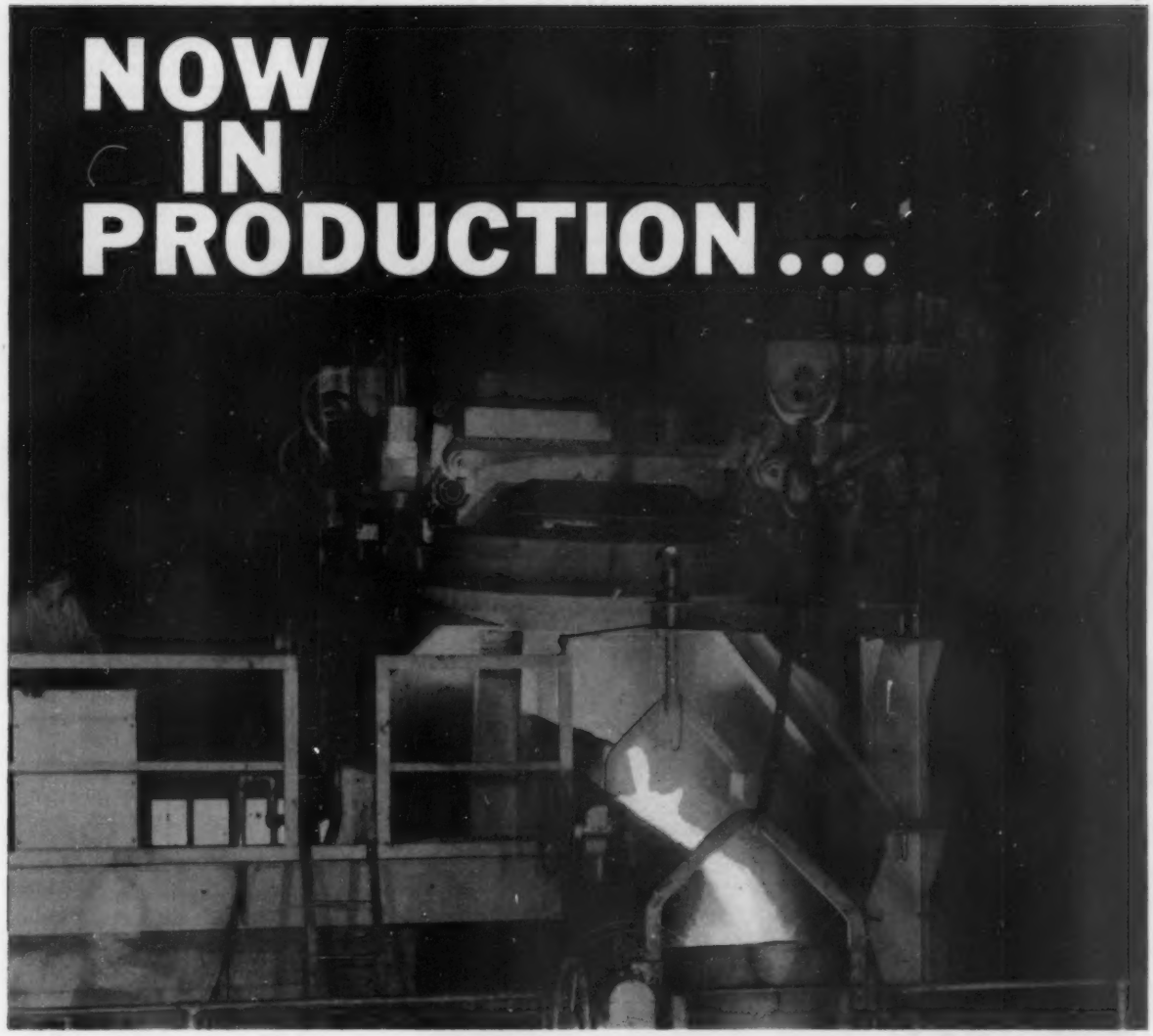

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Circle 651 on Page 55

$53,576; and Albion Malleable Iron Co., Albion, Mich., has booked substantial contracts for government installations.

Although pipe hanger and fitting volume is subnormal, producers of building and construction castings are doing a steady volume somewhat below expectations. In this category are manhole covers and drainage (highway) work. These shops operate largely on scrap. Iron and steel casting shipments by New England shops through July are estimated to be lower than in 1959—gray iron 7 per cent, malleable 5 per cent, and steel 8 per cent. Backlogs of malleable orders went off sharply in the second quarter and thus far in the third quarter.

There are a few brighter angles for foundrymen in raw materials. Cast scrap is lower, mixed cupola cast having declined $3 per ton in July. Revised freight rates on pig iron from Troy, N. Y., new basing point for most New England points, means a $2-3 increase instead of the earlier $4-5. From Troy to Claremont Center, N. H., the rate has been reduced to $5.68 per gross ton from $7.18. The commodity rate on metallurgical coke to New England points from New Haven was effective Aug. 15.

Waterbury-Farrel Foundry & Machine Co. soon will have moved all operations from Waterbury, Conn., to Cheshire, Conn., after many years at Waterbury. Foundry and other facilities will be expanded there.

Among nonferrous shops, those producing fine castings for the electronics industry are doing best, but they lack backlogs and operate on day-to-day bookings. Brass and bronze shops, although looking for better shipbuilding volume, have difficulty maintaining production schedules better than 50 per cent.

Philadelphia— With the vacation season over, a moderate increase in casting demand is anticipated. Business this summer has been short of expectations, however, even though a substantial drop had been contemplated, and optimism for this fall is somewhat more restrained than it was a few weeks ago.

Casting producers are operating four to five days a week, but some largely to provide service to regular customers. These schedules are generally maintained with limited working forces, and it is doubtful whether production is running at much beyond 55 per cent of normal capacity. Delivery promises range from about a week and a half to two weeks.

Steel foundries are operating at around the same general level as the gray iron shops. Output in this area is being sustained by a pick-up in some lines of heavy industrial equipment. Deliveries average around five weeks, which isn't very extended in view of the processing involved.

Malleable producers are estimated to be operating at around 60 to 65 per cent, well under the level of last spring. In fact, some trade leaders doubt if output is in excess of 60 per cent. Demand for fittings and hardware still lags.

Demand for brass and bronze castings is described as being worse than "spotty" in both job and captive shops. Producers of industrial

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MELTING DATA

500 LB.	1000 LB.	2000 LB.
Time: 30 min.	Time: 40 min.	Time: 45 min.
Oil Used: 11½ gals.	Oil Used: 19 gals.	Oil Used: 40 gals.
*Gas Used: 1400 cu. ft.	*Gas Used: 2800 cu. ft.	*Gas Used: 5250 cu. ft.

*1030 BTU

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of sufficient temperatures to pour light and difficult castings of excellent structure and machinability, with practically no rejects—that's the money-saving story behind the performance record of the revolutionary new U. S. "Sklenar" Reverberatory Melting Furnace. Innovations in combustion, design and construction, with patented features that contribute to faster melting, built-in economy of operation, and lower maintenance costs, are all yours in tomorrow's method of melting metals today!

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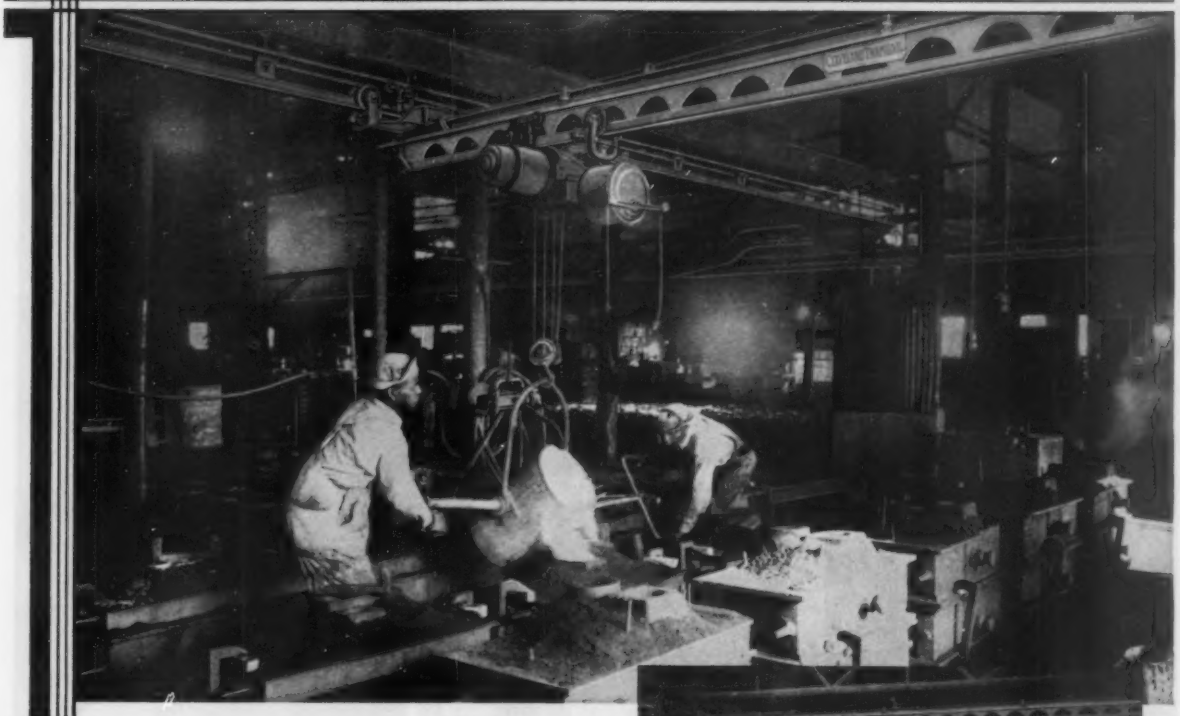

Texas Foundry Revolutionized with CLEVELAND TRAMRAIL

Before the advent of Cleveland Tramrail the Trinity Valley Iron and Steel Company, a gray iron jobbing foundry in Ft. Worth, Texas, was limited to the production of small castings because their flasks, molds, cores and ladles could be no larger or heavier than readily handled by hand, except in the main bay of the shop.

Practically overnight this concern was revolutionized by installation of a Cleveland Tramrail system. It took them out of the small casting class; they now can pour castings of any size, from the smallest to the largest. It cut drastically the time required for handling materials and thereby boosted efficiency greatly. It reduced metal heat loss because conveying time from cupola to mold is less via the Tramrail route. Safety has been aided.

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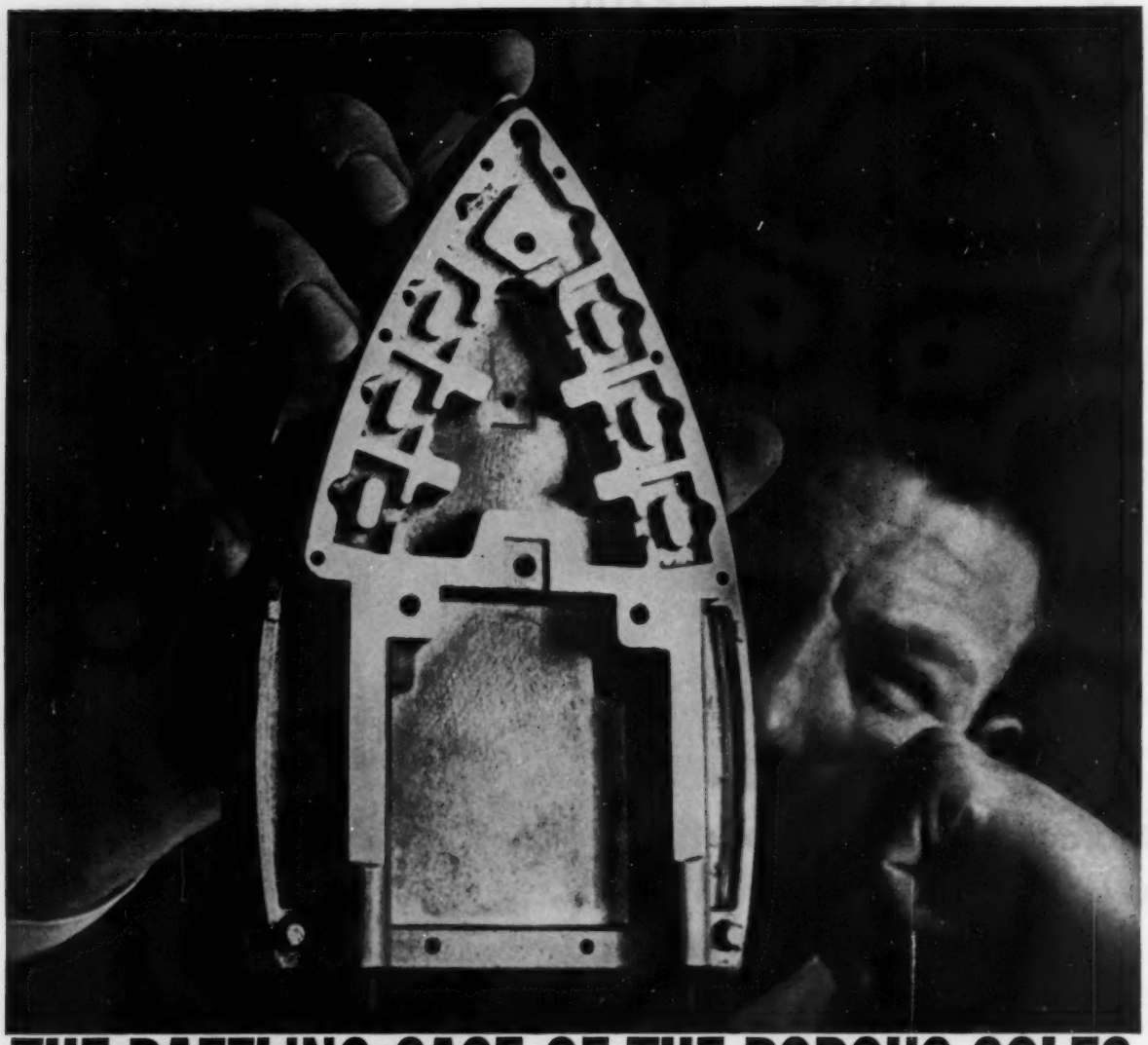

THE BAFFLING CASE OF THE POROUS SOLES

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valves and fittings are operating poorly—also the meter people, in a partial reflection of the drop in housing starts this year. Only in ship work does there appear to be any improvement. Red metal shops are operating at around 45 per cent of normal capacity. Aluminum shops appear to be doing best of all, with production estimated at 75 per cent of sand cast capacity.

Pittsburgh— Business is in a seasonal slump, made worse than usual this summer by the abnormally low rate of steel industry operations. With district open hearth production at less than 60 per cent of capacity, there's little demand for maintenance and repair castings. Mill purchasing agents have been charged to keep their inventories at a minimum. When they do place an order, they buy at low prices and expect immediate delivery.

Steel and gray iron foundries are operating at 45 to 50 per cent of capacity, and backlogs are negligible. As one foundryman put it, "If we didn't get any orders for two or three weeks, we'd be done." August shipments were larger than those in July, but only because vacations curtailed shipments then.

Although signs of improvement are hard to find, a gray iron jobbing foundry reports a moderate pickup in orders from industrial furnace manufacturers. "I hate to think where we'd be without that business," a sales executive declares. "As it is, we're working only four days a week with 12 of our 22 molders."

At nonferrous foundries, business conditions are relatively good. Unlike steel and gray iron shops, which depend heavily on one-time orders from equipment manufacturers, bronze foundries get a lot of orders for replacement parts for mill machinery. Current operations average about 65 to 70 per cent of capacity. "We're working five days a week with a split crew," a bronze foundry reports. "We don't have our full complement of molders or core men, but we're trying to give everybody at least 32 hours of work each week." Firms that have machine shops are doing better than those which don't. The trend is for buyers to purchase more machined castings.

Like the gray iron and steel foundries, producers of nonferrous castings complain about price and delivery pressures. Shopping by customers seldom has been more intensive. Inquiries are being received from firms in Chicago, New York, and Philadelphia—from companies that haven't been called on or heard from in five or six years.

In spite of their poor sales, foundries are continuing to invest in modern, labor-saving equipment. Manufacturers of foundry machinery say their business has picked up markedly in recent weeks. In July, sales of one foundry supplier were 20 per cent behind the previous year's pace. Today, they're on a par. Captive foundries in the automotive industry are showing great interest in automated equipment.

Chicago—The expected upturn in demand for castings during the last half of the year isn't developing as rapidly or as much as had been expected. The third quarter has proved a big disappointment, but there still are prospects for a substantial upturn in the fourth quarter.

The problem facing manufacturers of castings is the same as that confronting the whole metalworking industry. A reduced demand for consumer and capital goods restricted the purchases of raw materials and components and gave strong impetus to inventory cutting.

It had been expected that the decline in orders would bottom out in July and the upswing would be quite marked by September. Now it appears that the upturn won't be starting until September.

Plagued by new car inventories of something in excess of one million units, the automobile industry has been delaying volume production runs of 1961 models. The big push probably will not come before October.

Household appliance manufacturers found themselves overstocked in finished goods and have scaled down output until these inventories can be pared to reasonable levels. The same has been true of farm equipment and roadbuilding machinery. When freight car loadings began to dip late last spring, the railroads revised downward their buying programs for new cars.

DETROIT DIECASTING SHOW TAKES SHAPE

Exposition and Congress Will Have Wide Appeal

AS MANY AS 10,000 producers and users of diecastings are expected to attend the First National Die Casting Exposition & Congress, which will be held at the Detroit Artillery Armory, Detroit, Nov. 8-11, under the sponsorship of the Society of Die Casting Engineers. The SDCE is a national technical society devoted to the dissemination of technical information in the diecasting field.

Groups in attendance will include independent and captive diecasting and metalworking plant personnel, buyers of diecastings, diecasting engineers, suppliers, designers, and others with an interest in this type of casting and its applications.

Attractions include an exposition in which a total of about 80 exhibitors will participate. As of the first part of August, nearly 60 companies already had contracted for space. These firms cover virtually all areas of interest to diecasters and their customers. Among them are diecasting machine manufacturers, producers of die steel and dies, metal suppliers, makers of finishing equipment and supplies, furnace manufacturers, producers of lubricants, and many others, including diecasters themselves. Exhibits will be slanted toward technical and management people and will feature equipment and processes.

In conjunction with the exhibit, a technical program will be presented concurrently. A total of 24 papers will be offered at eight sessions—three papers each morning and afternoon of the four-day meeting.

Development of the program was based on a survey of diecasters to determine what areas are of the greatest interest to them. General subjects cover such topics as die design, metallurgical developments, quality control, vacuum in diecasting, die building, and similarly important areas. Technical co-operation is being extended to the SDCE by the American Zinc Institute, the Magnesium Association, and the Aluminum Smelters Research Institute.

Housing for visitors has been assured by the reservation of 2000 rooms in six leading Detroit hotels. The Sheraton Cadillac Hotel will be conference headquarters.

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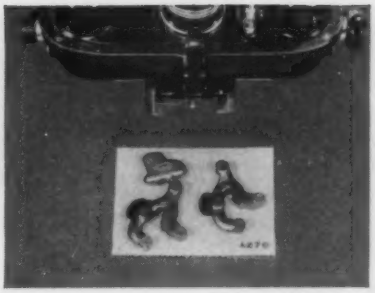

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From left to right at a conference function are Mrs. G. R. Shotton; G. R. Shotton, IBF president; Mrs. C. H. Wilson; C. H. Wilson, immediate past president; Mrs. Lewis; and Councillor Lewis, chairman of Malvern Urban District Council

Institute of British Foundrymen Meets at 57th Annual Conference

By M. M. HALLETT
Managing Director
Chamberlin & Hill Ltd., Walsall, England
European Editor, Foundry

● THE INSTITUTE of British Foundrymen met at Malvern, June 21-24, for its 57th annual conference. At the annual general meeting, G. R. Shotton was elected president, D. A. Richards senior vice president, and G. R. Webster of the London Branch junior vice president. N. P. Newman, treasurer of the Institute, reported on the satisfactory condition of the Institute's finances.

Technical Council—M. M. Hallett presented the annual report of the Technical Council and drew attention to the widespread nature of its activities, which were considered to involve the active co-operation of some 300 members of the Institute. New subcommittees had been set up on metal losses during melting operations, on the cause and prevention of finning, and on the heat treatment of aluminum alloy castings.

Medals Presented—The E. J. Fox Medal was presented to H. T. Angus, deputy director, British Cast Iron Research Association, for his outstanding services to the iron founding industry. A. Tipper, Harborough Construction Co., a well known authority on foundry sands and binders, was presented with the Oliver Stubbs Medal for long service to the Institute and the industry, particularly in the development of sands and binders.

The Meritorious Services Medal went to F. Shepherd for his long services to the Tees-side Branch and to the promotion of training within the industry. The British Foundry Medal and prize for the best paper of the year was awarded to G. D. McNair, of the Scottish Branch. Diplomas for outstanding papers were awarded to A. P. Riley and T. Hurst, G. L. Hancock and J. Taylor, and C. C. Hanson and A. D. Morgan.

Presidential Address — President G. R. Shotton spoke on the status and training of future foundrymen. He suggested that the engineer's frequent failure to appreciate the foundryman is due to the foundryman's failure to show any confidence and to define his difficulties. Manifold developments in the foundry industry are calling for a new type of professional foundryman, better trained than in the past and better fitted to foresee difficulties before they arise.

Present training systems have tended to lead to too early specialization, with the result that most foundrymen lack the broad background needed by modern industry. Now, young men should be given the broadest possible sound training on fundamental matters and should be encouraged to gain experience as a specialist in a number of different technical and management fields. This program must be

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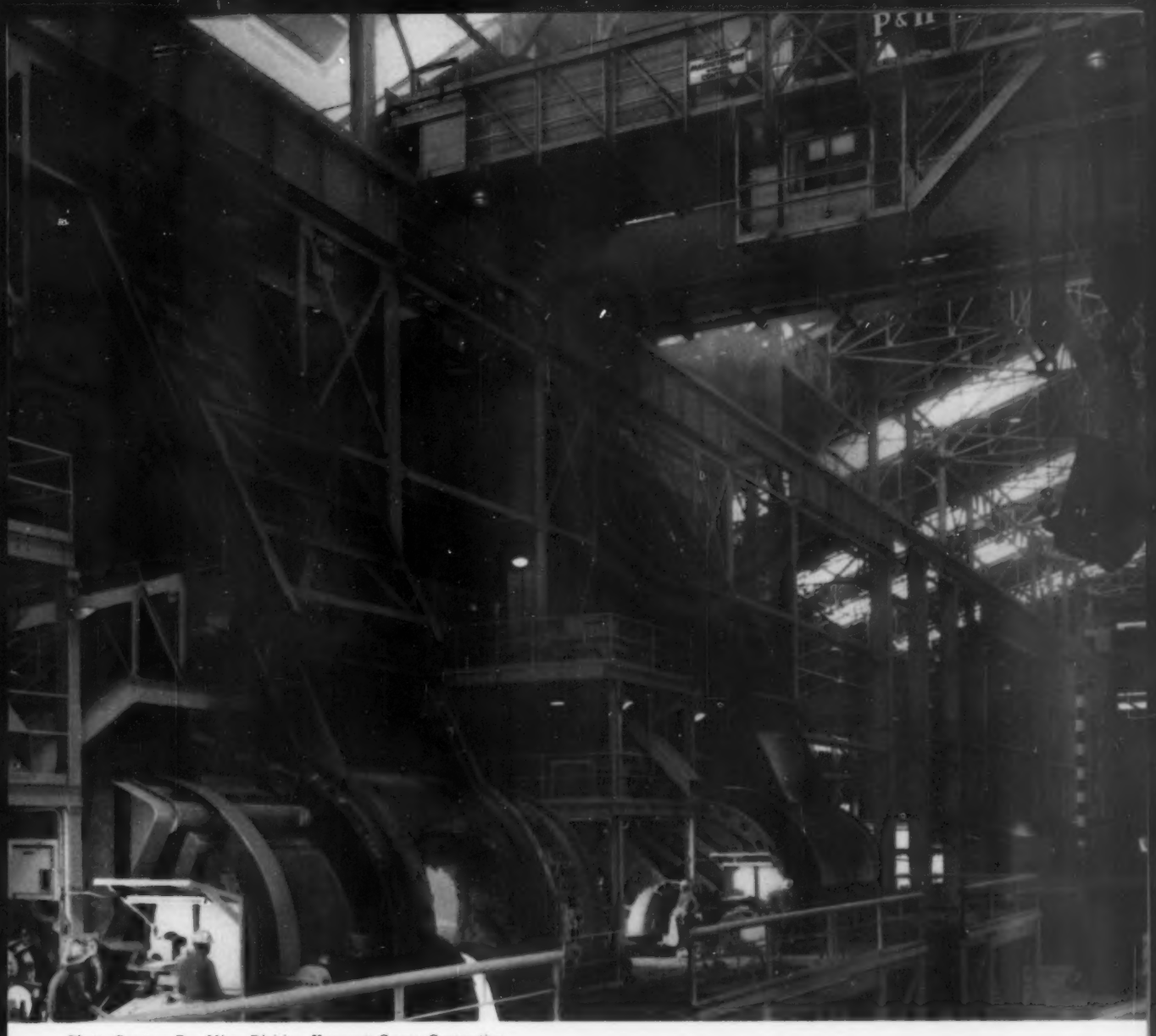

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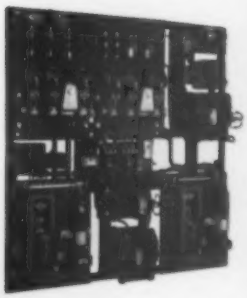

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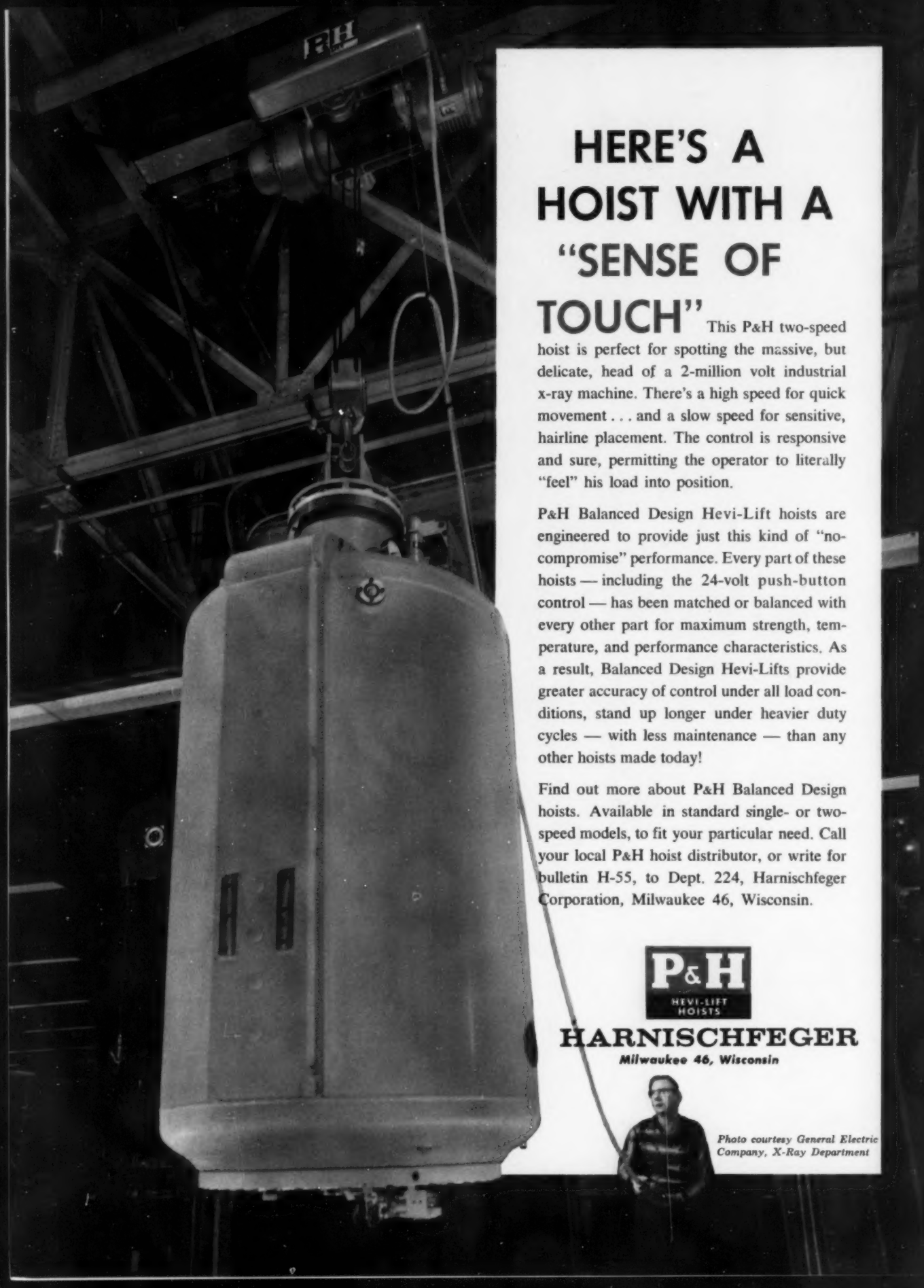

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accompanied by plunging the trainee into different foundry operations and forcing him to deal with them himself to gain the essential experience.

In addition to making use of the numerous avenues for gaining experience within the different fields of the Institute's activities, individual members could do a great deal to promote appropriate training by seeing that their young men were given suitable opportunities and experience. The formation of a properly trained professional body is closely bound up with the development of a proper status for the industry.

Edward Williams Lecture—In the Edward Williams Lecture, H. Morrogh, director, British Cast Iron Research Association, discussed research and industry. He pointed out that in the United Kingdom there is a tendency to believe that research work is carried out very well, but that application of the results is not effective.

In fact, this impression is not accurate, and the belief is shared by most industrial countries. A point which often affects the speed of application of new ideas is the existing state of the industry. It is much easier for a backward company to progress rapidly than it is for a company which already is efficient.

Research can be divided into pure research, carried out mainly in industry, and technological research, which itself can be regarded as either fundamental or applied. Fundamental research is divided between industry and academic workers, but applied research is essentially a matter for industry.

Most applied research in past years has been metallurgical, and it now is necessary to study molding materials and working conditions. Such investigations demand the use of large plant, and even research organizations must be provided with equipment to carry out experiments virtually on a works scale, as was done with the new hot blast melting unit at the British Cast Iron Research Association.

The cost of industrial research is extremely high. Official figures published in England showed that in the iron and steel industry, the cost of each research worker with his assistants is £6,000 ($16,800) per annum. The figure is likely to be the same in the foundry industry, but much higher in some other industries. This cost means that to have the smallest research department, a company needs a turnover of at least £500,000 ($1.4 million) per year.

For most companies, the way to research is co-operation, as under the sponsorship of the Institute's Technical Council or through the research associations which are co-operatively financed with substantial assistance from the government. In any event, research has to be so planned that reasonable freedom is provided for workers to follow up unexpected results. The latter often are more rewarding than the limited field of the original plan would suggest.

H. T. ANGUS
Fox Medalist

Technical Sessions

As usual, technical papers at the conference were read and discussed at six individual sections, each taking a group of three related papers in half a day. At the first session, the third report of the Institute's Subcommittee TS.43 on cupola developments was read by its chairman, G. J. Shaw. This report brought up to date comparative information on the performance of hot blast and cold blast cupolas.

Particular attention had been paid to water cooling, and figures had been obtained from practically all operators of water-cooled cupolas in the country. Unfortunately, it was not possible to deduce many general principles from this comparison, partly because conditions varied greatly from plant to plant and partly because few people had complete information on such points as the amount of makeup water.

It was shown, however, that although water cooling led to considerable reductions in refractory consumption, increased coke consumption was necessary to maintain existing metal temperatures, particularly in small cupolas. On the other hand, the time of operation could be extended considerably.

The report also included information on slag composition and on

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the assessment of slag by observations of its color. No consistent color relationship was found which was applicable to all plants. Particular attention was drawn to the relationship of slag basicity to sulfur pickup and carbon content.

In the discussion the question of tuyere velocity was raised, and it seemed to be agreed that this factor is more important in unlined hot-blast cupolas than in lined cupolas. The position of the melting zone can be easily raised by variation in tuyere velocities.

It also was agreed that in any one foundry, slag color is a useful control test. Generally, however, it is not possible to compare results from one foundry with those from another. The question of the possible use of steel or stainless steel tuyeres, whether protruding or not, was discussed, but most seemed to use copper tuyeres.

Cold Blast Cupola Described

B. R. Douglas described use of a cold-blast, basic-lined cupola without water cooling. This unit was based on Italian practice and was designed particularly to produce a high-carbon, low-sulfur molten iron suitable for making spheroidal graphite (or nodular) iron. Various experimental stages and troubles which occurred because of lining wear were described.

The current method uses a working surface of hand-rammed, stabilized dolomite set against magnesite bricks separated from the acid bricks against the shell by a layer of rammed basic material. Under these conditions, with additions of calcium fluoride and calcium carbide and with some enrichment of the blast with oxygen for the first four minutes, iron could be produced from a charge of 62 per cent steel and 38 per cent returned scrap with a carbon content of 3.9 per cent and sulfur content of 0.015 per cent. It was produced at a temperature of 2610° F, which is well suited for the production of spheroidal graphite iron.

In the discussion of this paper, the effect of calcium carbide and the importance of temperature in relation to coke consumption were questioned. The carbide was found to be necessary to reduce the iron oxide content of the slag to low levels, and it was agreed that the effective coke ratio might change during the run because of wear on the lining. Since water cooling was found necessary to reduce hot spots toward the end of the run, it was suggested that water cooling should have been used the whole time.

The author considered that in that case they would have had to incorporate pig iron in the charge instead of some of the cheaper steel scrap. It was also suggested that continuous slag tapping would have been helpful, and the author replied that a continuous front slagger was being installed.

Stress Relief—The third report of TS.32, on the effect of vibration on stress relief of castings, was presented by the subcommittee chairman, M. M. Hallett. Various practical experiences in the foundry which could be attributed to a possible effect of vibration and shock on internal stresses had led to the suggestion that deliberately applied vibration might be employed to relieve residual stresses. The literature was meager and not helpful, and the subcommittee had, therefore, carried out two series of tests.

In one, castings known to contain internal stresses were subjected to ordinary foundry treatments such as attachment to a pneumatic vibrator or to a knockout grid or to barrel finishing. Change in stresses then was measured. The other series involved applying an exactly known stress to a test bar, then applying a vibration and measuring the change in stress. Both series of tests suggested that any relief of stress, if it existed at all, was of such a small amount that it could be neglected and that vibration could not be recommended as a means of avoiding stress relief heat treatments.

In the discussion, a written contribution from K. Gut of Switzerland was read. He reported a series of tests in which castings with internal stresses were subjected to pulsations in a testing machine applied over a wide range of conditions. These tests all tended to increase rather than decrease internal stresses and completely confirmed the views of the subcommittee.

The discussion centered around the correction of distortion in castings and did not disclose any belief

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Iron Solidification—The next cast iron session opened with a paper by H. Morrogh on the solidification of cast iron and the interpretation of results obtained from chilled test pieces. This was an authoritative review of current opinion on these fundamentally important questions.

The solidification of iron was described in terms of nucleation and growth phenomena, and the dependence of the number of nuclei on the amount of undercooling was illustrated with reference to the effect of such treatments as holding the melt, superheating, and agitation before pouring, all of which reduce the number of nuclei. On the other hand, inoculation increases the number. The effects of sulfur on increasing the number of nuclei but reducing the rate of growth of the eutectic cells, with the corresponding inverse effect of manganese was illustrated, as was the effect of phosphorus in increasing the number of nuclei.

These general principles then were considered in relation to the solidification of normal chill test pieces. It was pointed out that the chill test piece samples solidified not only from the chill face, but also from the sides of the mold.

A series of diagrams illustrated how the two solidification influences would reach different parts of the casting at different times after pouring and so control the appearance of white or gray iron. Such considerations enabled the conflict-

"Did you hear that Fred took first place in a rumba contest last night?"

ing results reported for effect of such factors as pouring temperature and the size of the test piece to be explained in a logical manner.

A brisk discussion followed this monumental paper. After reference to self-annealing phenomena, it was suggested that nucleation and growth could be invoked to explain any solidification facts merely by changing the assumptions according to the needs. It also was suggested that the actual form of the cooling curve and the consequent temperature of solidification determined the mode of solidification.

The author felt, however, that nucleation and growth must play a part and that any explanation must pay due regard to them. The effect of vibration of the molten metal was considered and the relative influences of the two phases forming the eutectic.

Pearlitic Malleable—The American exchange paper, on pearlitic malleable iron, was presented by Carl F. Joseph, Central Foundry Div., General Motors Corp., and described the production of Arma-Steel, as GM calls its pearlitic malleable. Details were given of heat treatment procedures and of the use of bismuth and boron.

Particular stress was laid on the machinability of the product in relation to that of other materials of comparable strength. Hardenability also is important, and a number of applications of this material in the automotive industry were illustrated. Special attention was directed to the procedures for maintaining quality.

The discussion started with some consideration of the make-up of the charge and the sources of steel scrap. Reference also was made to the need to reduce the quenching temperatures as far as possible to avoid distortion.

Blackheart Malleable — Another report from the British Cast Iron Research Association was presented by C. T. Moore and dealt with the properties of ferritic blackheart malleable cast iron. This paper presented a large amount of data and laid particular stress on impact properties in relation to temper embrittlement.

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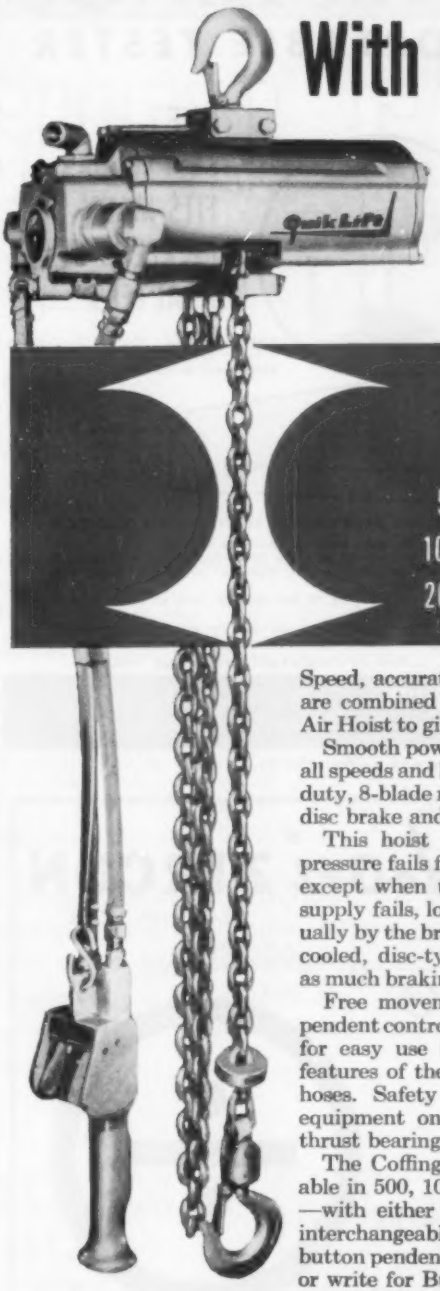

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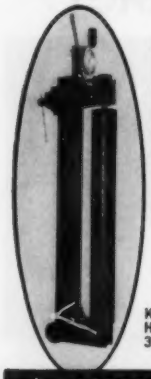

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phorus and 1.6 per cent silicon has a transition temperature well below the freezing point and is, therefore, safe in ordinary practice. Without this heat treatment, the safe limit for phosphorus is only 0.1 per cent at a silicon content of 1.1 per cent and as low as 0.05 per cent phosphorus at a silicon content of 1.6 per cent.

The effects of silicon and phosphorus on tensile properties also were studied and again showed the desirability of subcritical quenching from 1100° F followed by a draw at 575° F if brittle failure is to be avoided. The effects of composition in bend test pieces also were considered.

In the following discussion, comparisons were drawn between British and American practice in blackheart malleable iron. The higher proof stress of the American material is believed to be connected with a relatively high phosphorus content which, in the British view, leads to a danger of brittle failure in some instances. It was clear from the discussion that failure of this type had aroused considerable interest in some quarters. It appeared to be related to the temper brittleness of heat treated steel, but the mechanism was not understood.

Carbon Dioxide Sand—J. M. Middleton, British Steel Castings Research Association, presented a paper on the effect on a green sand of contamination by used CO_2 process sand. This work was carried out because of fears expressed that such contamination might be deleterious. A standard test casting in a medium-carbon steel was made in two series of sands, in each of which the addition of used CO_2 sand ranged in steps from 0 to 100 per cent.

In one series, the green strength properties of the sand were kept constant (and therefore the addition of bentonite varied); and in the other series the addition of bentonite was kept at 5 per cent with consequent variation in green strength properties. In each, large quantities of CO_2 sand reduced the dry strength of the mix and brought about increased susceptibility to erosion and scabbing difficulties. At constant green sand strength, the maximum amount of CO_2 sand which could be tolerated was 12½ per cent, but with a constant clay

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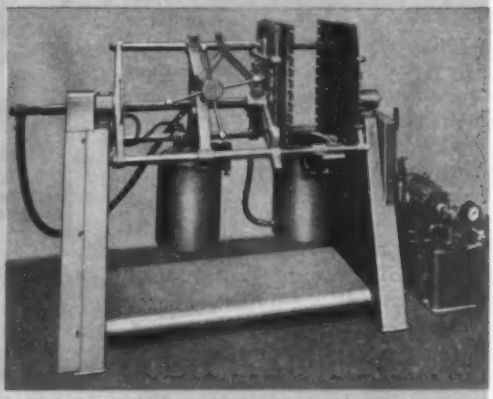

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addition of 5 per cent, there was no trouble until the used CO_2 sand content reached 50 per cent.

In the discussion it was suggested that the results were somewhat misleading because many foundries were successfully using sands contaminated with CO_2 sand. It was suggested that a better solution would be to lower the bentonite additions slightly, but keep the moisture content higher.

The author replied that steel foundries do not like higher moisture and also experienced more scabbing with lower clay contents, but he agreed that a combination of 3.5 per cent moisture and 3.5 per cent bentonite addition might be reasonable.

Other speakers pointed out that the CO_2 process is not used in all steel foundries, but the author replied that the process is helpful when molds have to stand. It was agreed that the test casting used was very good at showing up poor sands, but was not sensitive enough to compare relatively good sands.

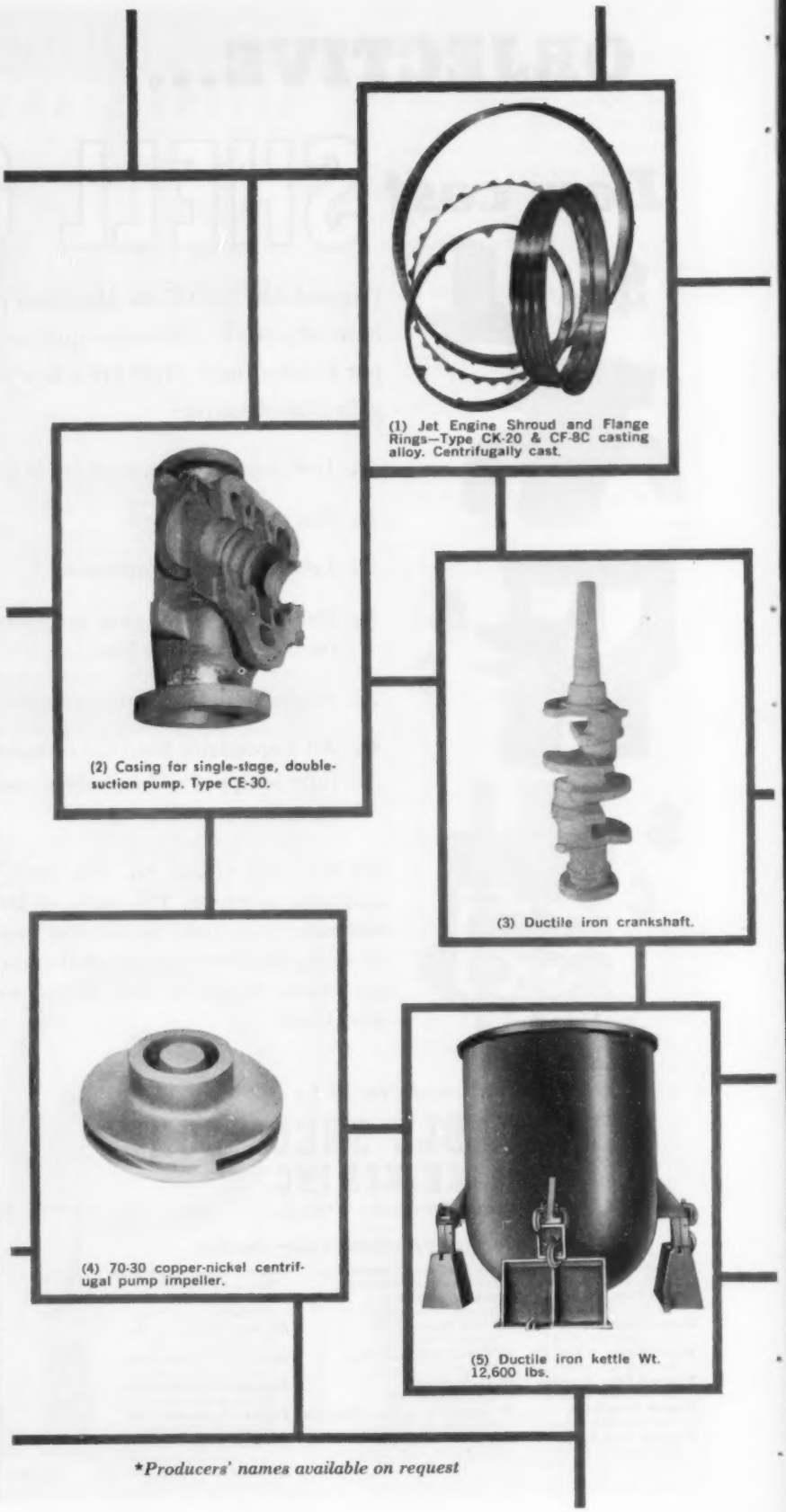
Hot Tearing in CO_2 Molds

The second paper by Mr. Middleton dealt with the effect of CO_2 process sands on hot tearing. A test piece was designed for this purpose, and experiments were made in a number of foundries comparing CO_2 process sands with oil sand, dry sand, and green sand. The effect of various additives such as bentonite, cereals, and molasses were tried on CO_2 sands.

In a further series of tests, casting temperature, steel composition and melting practice, mold density, and sand preparation procedure were studied. Results showed that CO_2 process sands led to the same amount of hot tearing as normal dry sands, being rather better than oil sands. The addition of organic materials to CO_2 sands was deleterious rather than otherwise, but a small amount of clay might be helpful.

Of the normal foundry variables, high casting temperatures were found to aggravate tearing, and hard ramming to produce dense molds was particularly dangerous.

The discussion on the paper did not bring out any new points, but it was agreed generally that CO_2 sands are not more dangerous than



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oil sands so far as hot tearing is concerned.

Mold Drying—W. J. Colton, chairman of the committee, presented the second report of TS.39 on mold drying. This provided new data on the effect of ramming density on drying which, taken in conjunction with the work in the earlier report, demonstrated that the predominant factor controlling rate of drying at any temperature is the quantity of water to be removed. In this sense, ramming density would increase the time needed to dry to a certain depth, but at a uniform moisture content per volume it had little effect. Permeability was also confirmed as having a relatively minor effect on the drying rate.

The second part of the report considered the mechanism of drying and the influence of various factors on the rate of drying. The third part described in detail the different types of probes which had been developed by the committee to measure the depth to which drying takes place.

Michigan Foundry Conference To Stress New Developments

Annual AFS Michigan Regional Foundry Conference will stress new developments in molding, melting, design, safety, modernization, and marketing, and how they can be adapted to profitable use.

The two-day meeting will be held at the Bancroft Hotel, Saginaw, Mich., Thursday and Friday, Nov. 3-4.

Program details follow:

Thursday, Nov. 3

Morning:—"Permanent Molding," speaker to be announced. "Magnesium Die Casting," Steve Strong, A. C. Spark Plug Div., GMC, Flint, Mich. "Ductile Iron," William McMillan, Ohio Ferro Alloys Corp., Canton, Ohio

Luncheon:—"What To Do if Your Foundry Catches Fire," speaker to be announced

Afternoon:—"Furfural Cores," speaker from Pontiac Motor Car Div., GMC, Pontiac, Mich. "Should You Consider an Automated Sand System?" Randolph Dietert, Harry W. Dietert Co., Detroit. "How To Set up a New Foundry," J. W. Nuss, American Radiator & Standard Sanitary Corp., Louisville, Ky., and Eric Welander, John Deere Malleable Works, East Moline, Ill.

Banquet: Speaker to be announced

Friday, Nov. 4

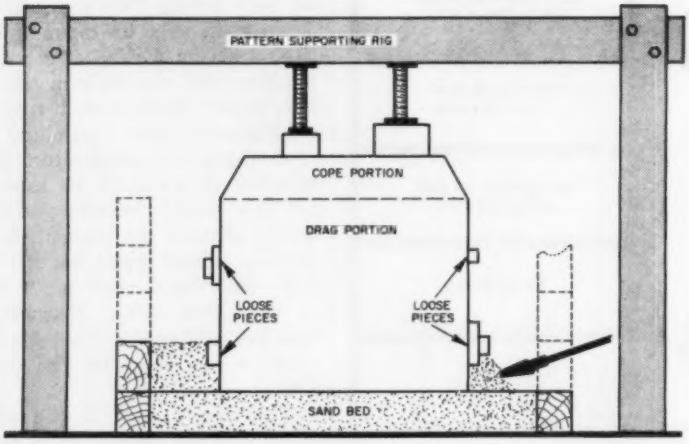
Morning:—"Selling Castings to the Aircraft Industry," Harry Gravlin, Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn. "Shell and CO_2 Core Processes," Speaker to be announced. "Casting Design," Jack Flitz, Central Foundry Div., GMC, Saginaw, Mich. Group Discussion—Chairman, Nicholas Sheptak, Dow Metal Products Co. Div., Midland, Mich. Student Session, Speaker to be announced

Luncheon:—Speaker to be announced

Afternoon:—Plant Tours — Chevrolet-Saginaw Gray Iron Foundry Div., GMC; Central Foundry Div., Saginaw Malleable Iron Plant; Dow Chemical Co.

Trouble Shooting

By C. W. AMMEN



As shown here the drag is being made in sections or cheeks. When this practice is used, sand can be rammed under horizontal projections on the drag pattern

Using Horizontal Ramming

Dear Charlie:

Now and again we have a job a bit too heavy to roll over with our crane. Most of the time, it's the drag which presents the problem; the cope we usually can manage. For a part like a tall bushing, cast vertically, we can add drags as we work up, but how would you handle this problem with an odd-shaped pattern with 75 per cent of its bulk in a deep drag?

Sincerely,
Sam

Dear Sam:

To make something beyond the capacity of your crane, you can use one of several methods, depending on the kind of a pattern you have. For instance, if the bottom or drag portion of a one-piece pattern is one big print with a flat bottom and vertical sides, it is set on a rammed and swept sand bed and belted down good and hard to insure good contact. Then the sand is rammed in layers which should not be too thick to prevent uniform density.

After ramming, the parting is made, the joint sprinkled with dry sand, and the cope flask set on and rammed up. Cope is lifted off and the pattern withdrawn from the drag. The drag cavity then is filled with cores made from the coreboxes supplied with the pattern, to give the cavity the proper contour.

Again, if the drag portion of the pattern is somewhat like a block or print with a number of projections in the form of loose pieces attached so that they remain in the mold when the block pattern is withdrawn, it is preferable to make the drag in sections or cheeks. That is necessary to permit horizontal ramming on the underside of the projections to secure proper sand density. As in the previous instance, the pattern is set on the bed and pounded down. If the bottom part of the drag is not flat, it may be necessary to provide some type of rigging to hold the pattern solidly in the desired position so that it cannot move up or sidewise during ramming.

After the pattern is in position, sand is rammed horizontally against the pattern underneath the projecting loose pieces all around the pattern. That operation must be done carefully so that no soft spots occur. Rammed sand should extend outward from the pattern to the edge of the projections and vertically to the centers of the projections. Then the flask or cheek is placed in position (remove the supporting rigging temporarily if necessary), and the space is filled with sand which is rammed into position.

Again, in place of solid flasks, you could make a number of cast iron members which could be bolted together at the corners to form flasks. Such an arrangement would eliminate the necessity of taking the rigging down to set the flask and putting it back.

That cheeking procedure is followed until the parting line has been reached. Cope is made, and lifted off. The pattern with bottom block section is withdrawn, and the loose pieces are pulled out.

Instead of metal flasks, the cheeks might be built up with heavy planks which are held in place by heavy angle-iron corner posts driven into the floor, braced if necessary, and with channel irons located vertically along the sides between the corner posts, if required.

That is all to the good as far as it goes, you say—but what about the drag of a one-piece pattern which has those projections or what-have-you which are fastened tightly in place and cannot be removed except by major surgery. Well, that

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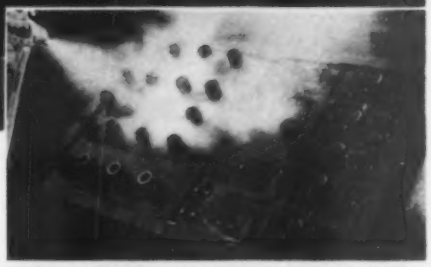

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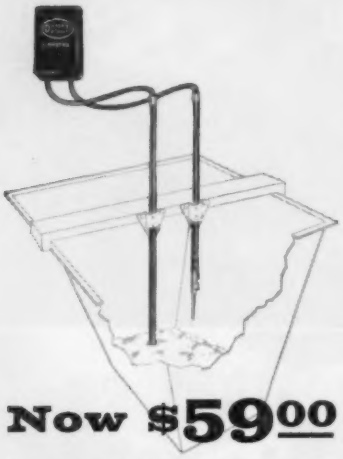

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is something else again, and the drag mold will have to be made as a series of drawbacks which can be moved away or drawn back from the pattern so that it can be lifted away.

Beginning step is the same as described—setting the pattern on the rammed and swept bed and hammering it down for good contact. The bed in this instance will have to be large enough all around so that the several mold sections or drawbacks can be pulled far enough from the pattern to prevent any interference during its removal. As before, rigging may be needed to hold the pattern firmly in place.

Estimate Number of Drawbacks

Now you will have to figure out from the pattern conformation how many drawbacks will be required—the fewer the better, of course—to cut down the number of joints or partings, but that may involve a handling problem. Large sections are harder to move than small ones, so common sense will have to apply.

To get on with the story, we will assume that the mold can be made in four vertical sections or drawbacks—two sides and two ends. To make the drawbacks, either the built-up plank method or the bolted-member flask can be used since horizontal ramming will have to be done. With the built-up plank flask, the angle corner posts cannot be driven into the floor since they would be in the way when the mold sections are drawn back; accordingly, they will have to be located by suitable bracing.

You can make either the two drawbacks for the sides or those for the ends first. The initial step is to erect vertical partitions of planking or heavy sheet metal, extending from the corners of the pattern to the flask and from the bed to the parting line. They must be braced suitably so that they remain straight vertically and horizontally. Then a layer of newspaper is placed on the bed, and the drawback built up in sections as described.

Use plenty of long horizontal and vertical reinforcing rods to produce a rigid structure. Also, include some eyebolts or hooks tied into the reinforcing rods and judiciously located on the side to aid in drawing back the completed section.

After one section or drawback has been completed, its opposite member is built up in the same manner. Then the vertical planks or sheet metal partitions are removed and the exposed faces of the mold sections are covered with layers of newspaper. By this time you probably understand that the newspaper is used to provide a parting to prevent the sand sections from sticking together, and creating a problem. Following application of the newspaper on the joints, the other two drawbacks are rammed up.

Now the cope flask is put in position, rammed up, and lifted off. The metal or wood flask sections are removed from around the drag mold, and the drawbacks forming it are pulled horizontally away from the the pattern—sufficiently so that it can be lifted out. Then all the newspaper partings are removed and the drawbacks pushed back carefully into their proper positions. The flask sections are put back into place to hold the assembly firmly together. As a further precaution, all the joints or partings should be mudded up on the cavity side.

So much for one-piece patterns. Now we will take a look at split patterns. Here again, several procedures are available.

If the drag section is in the form of a straight side print or one with loose pieces attached, it can be made as described for a one-piece pattern. Another method is to place the pattern on a board with the joint or parting down and ram it up in sections or cheeks. The flask will have to be solid or tight, and the cheeks must contain gaggers or other reinforcement to permit lifting off and rolling over. The top or last flask should contain bars or grids since it forms the bottom or drag of the mold when it is rolled over.

After the several sections or cheeks have been completed, the top section is lifted off, rolled over, and placed on the floor. Then the cheeks in order are lifted off, rolled over, and placed successively on the drag section. If the drag pattern contains projections which cannot be removed, it will have to be made with drawbacks as described earlier. Since the pattern is split, the cope is made separately.

Sincerely,
Charlie

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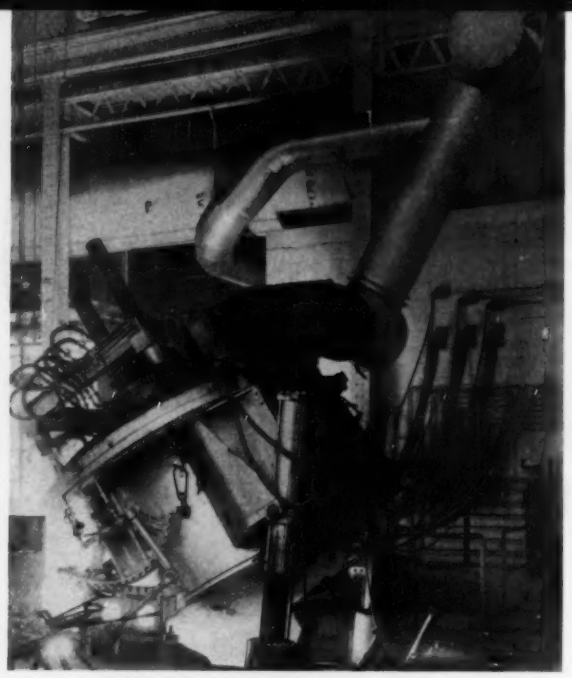

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● DUST AND FUMES from melting in an electric furnace are no longer a problem to General Railway Signal Co., Rochester, N. Y. As a part of a recent foundry enlargement and modernization program, the company's Whiting 6 MT unit was equipped with a Pangborn special electric furnace exhaust hood, and a dust collector was installed.

As a result of this improvement, several hundred pounds of dust per week are prevented from settling in the foundry and the surrounding neighborhood. Operations and plant housekeeping have benefited.

Quality of workmanship is considered important at GRS. This company, for many years, has been one of the largest railway signal manufacturers in the U. S. and now produces control systems and devices for airways, thruways, airports, rapid transit systems, monorail systems, police control, fire control, navigation, and mining.

The company not only does all the casting and forging of parts used in its own systems, but also furnishes custom foundry services to many other industries. Facilities include pattern shop, steel foundry, gray iron foundry, nonferrous foundry, and forge shop.

The 6 MT furnace melts 3 tons of steel or 7000 lb of iron per heat, usually in 80 to 90 minutes. The electric furnace exhaust hood is equipped with a 24-in.-diam telescoping and swivel connection to provide constant ventilation throughout melting including the tapping and slagging operations.

The Pangborn exhauster is provided with a pneumatically operated outlet damper which is adjusted for normal operation of 8500 cfm. During oxygen lancing, a pushbutton control opens the outlet damper so the exhauster handles 12,750 cfm.

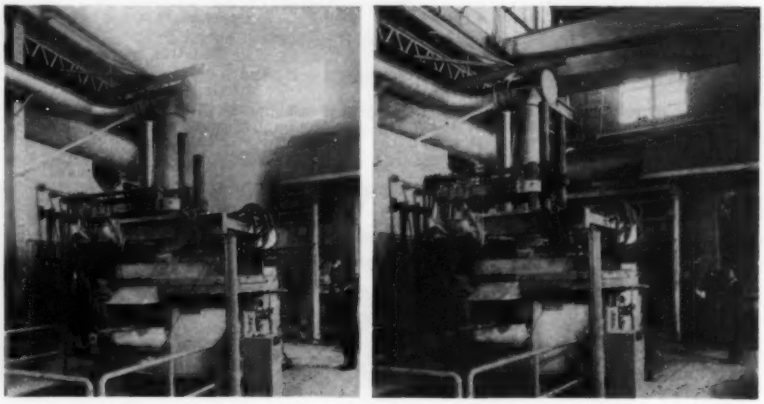
A manual tempering damper on the lower swivel tee of the telescoping connection adjusts the amount of air being exhausted from the furnace (so the chemistry of the melt cannot be upset).

The dust collector is equipped with 4760 sq ft of orlon filter cloth which provides a 1.7:1 air-to-cloth ratio during oxygen lancing. The orlon bags give safe and effective filtration at temperatures up to 275° F.

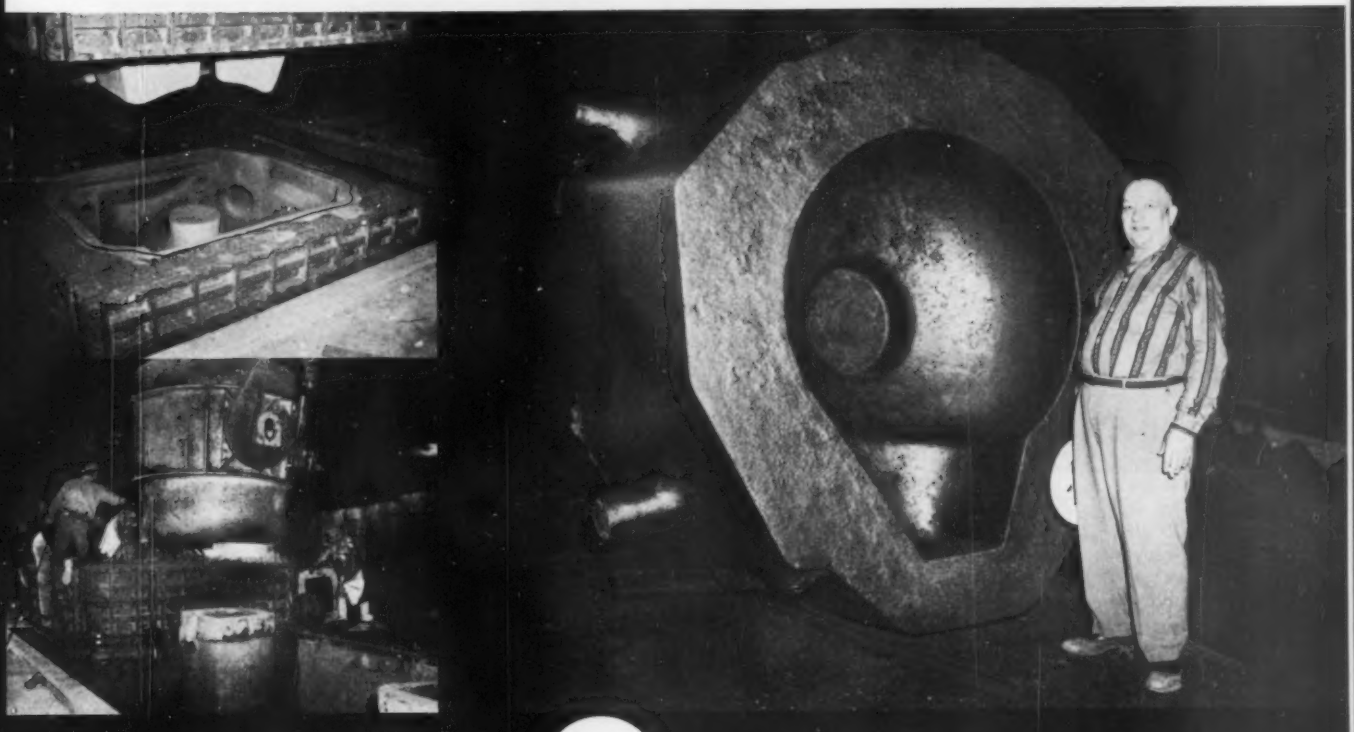
To safeguard the orlon bags, a by-pass damper with control is installed in the exhaust piping at the collector inlet. If temperatures above 275° occur, the by-pass damper automatically routes furnace smoke, dust, and fumes around the collector and discharges them to the atmosphere.

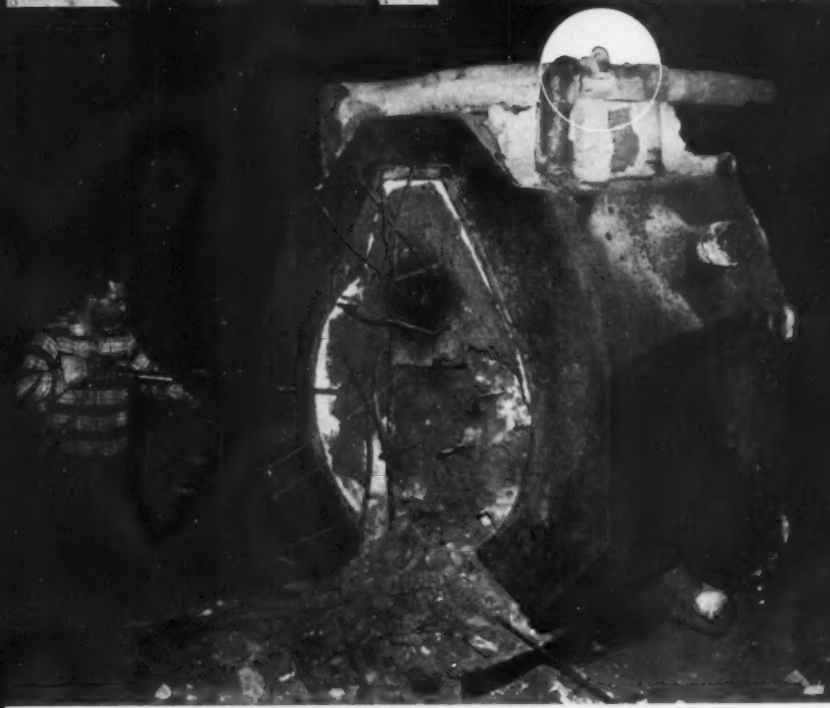
No exact figures are available on the amount of dust collected. Filter bags are shaken automatically whenever the exhauster motor is shut down and hoppers are emptied at regular intervals. However, similar Pangborn electric furnace dust control systems have yielded an average of 12 lb of dust for each ton of melt.

Left, when dust collector is turned off, fumes and dust fill entire area hampering both men and machines. Right, dust collector completely clears area of dust and fumes from furnace



BIGGER and BETTER CASTINGS poured with LOUTHAN refractories





Cameron Iron Works in Houston, Texas, which has for the last two years been casting its own forging dies with considerable success, is understandably proud of the 24-ton casting shown in the photograph above.

Poured through Louthan refractory runner tile, the casting is without defect. Note the clean, smooth surface of the gate (circled area of photo at lower left). Here's proof again that Louthan refractories stand up on the job.

Whether you're working in iron or steel, on small parts or huge castings, you'll find Louthan Refractories completely dependable—saving much more than they cost you. Why not try them soon? A complete line of strainer cores, breaker cores and runner tile is available.

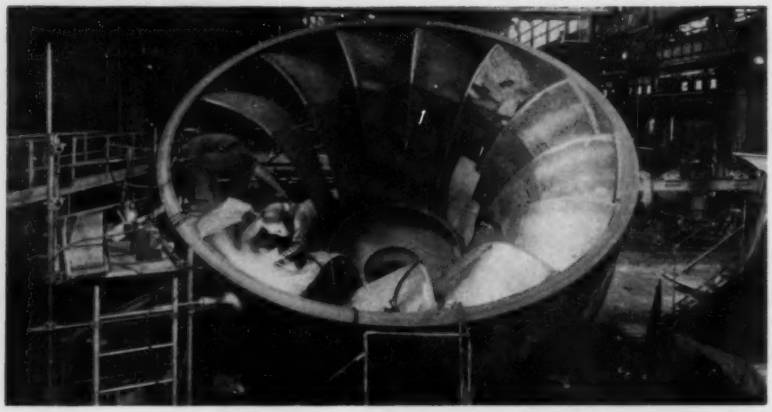
LOUTHAN . . . EAST LIVERPOOL, OHIO

a unit of FERRO CORPORATION . . . *Refractories Division*

Circle 669 on Page 55

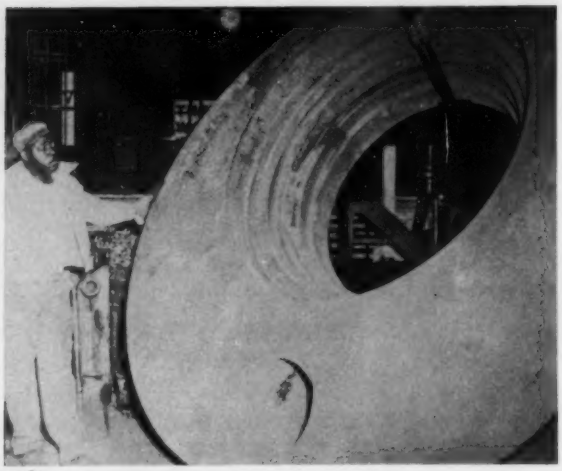
REPRESENTATIVES: M. A. BELL COMPANY, St. Louis 2, Mo. . . Houston 3, Texas; **MILWAUKEE CHAPLET & SUPPLY CORP.,** Milwaukee 46, Wisc. . . **FREDERIC B. STEVENS INC.,** Detroit 16, Mich. . .Indianapolis 7, Ind. . . . Buffalo, N. Y.; **FOUNDRY SPECIALTIES COMPANY,** Chicago 38, Illinois

News Views



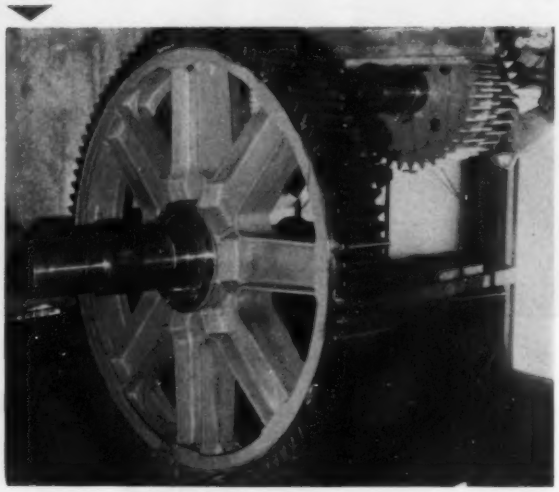
TURBINE RUNNER: Cast and rolled parts are being used to fabricate 7 hydraulic turbine runners for the Oahe project in South Dakota. Cast steel blades are being welded to the rolled steel band and cast steel crown. All 7 units, made by Allis-Chalmers Mfg. Co., Milwaukee, are each rated at 128,500 hp. The runner has a 218-in. OD and weighs 90 tons. Situated on the Missouri River 6 miles northwest of Pierre, S. Dak., the dam has a crest length of 9300 ft and is 242 ft high. It will be the second largest earth-filled dam in the U. S. A.

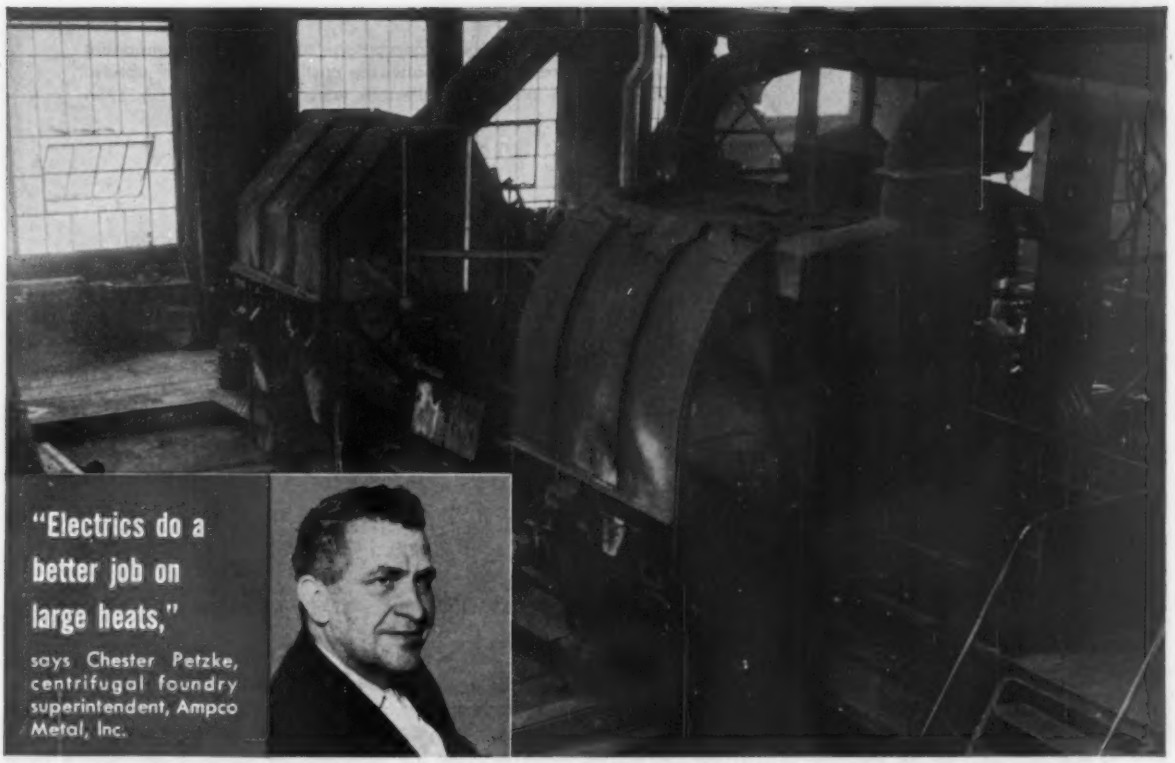
RIBBON-CUTTING: As guests and company officials watched, Orville Freeman, governor of Minnesota, used a welder's torch to cut a ribbon of silver alloy across an entrance to the new Minneapolis Service & Training Center of Eutectic Welding Alloys Corp., Great Lakes Div. The ribbon is used in furnace and induction brazing of metals and carbides and is one of the products handled by the new center. The ceremony began a two-day open house which included demonstrations of welding techniques

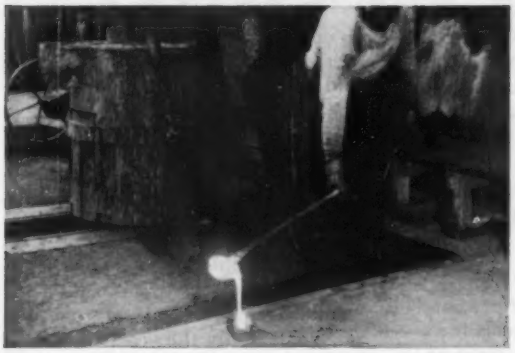


REACTOR MANIPULATOR: This ductile iron casting is part of a 34,000-lb-rotary manipulator for the first nuclear-powered merchant vessel, N. S. Savannah. The manipulator will replace depleted fuel elements in the ship's atomic reactor. Babcock & Wilcox Co. designed the unit, and parts were cast by Bethlehem Foundry & Machine Co.

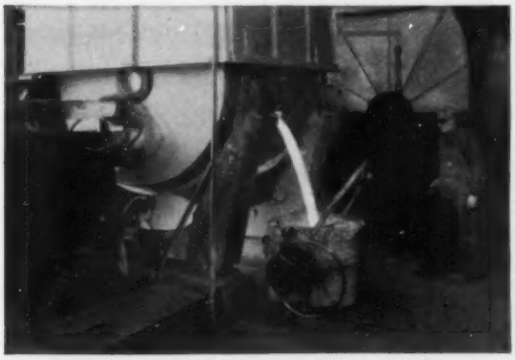
SUGAR MILL GEARS: Avondale Shipyards Inc., Service Foundry Div., New Orleans, recently completed the huge mill gear and two pinions shown here. The sugar mill components were ordered by E. I. Dennis Engineering Co., consulting engineers for A. Wilbert & Sons, mill owners







Test bar is poured to check physical and chemical characteristics of the melt before emptying furnace into ladle.



Detroit Electric Furnaces range from the giant 8000 lb. Type CM shown above to 10-20 lb. Type ICID investment casting furnaces.

DETROIT ELECTRIC FURNACES have a 20-year service record at Ampco

"Ampco has long been a leading producer of bronze castings," says Mr. Petzke. "Most of our melting is done in Detroit rocker-type, electric-arc furnaces."

Detroit Electric Furnaces in service at Ampco range from 1200 pounds capacity to a giant 8000 pounder. Detroit Electrics have been turning out high quality alloys at Ampco for twenty years!

The indirect arc operation of these furnaces guards the melts from contamination, and their rocking action means homogeneity of the molten metal and optimum utilization of heat.

Other advantages of Detroit Electric Furnaces are faster melting, less metal shrinkage, longer lining life, uniform quality melt after melt, lower operating costs.

Detroit Electric Furnaces can meet your most exacting requirements—and save you money at the same time!

DETROIT ELECTRIC FURNACE
DIVISION OF
Kuhlman Electric Company
Bay City, Michigan

Circle 670 on Page 55

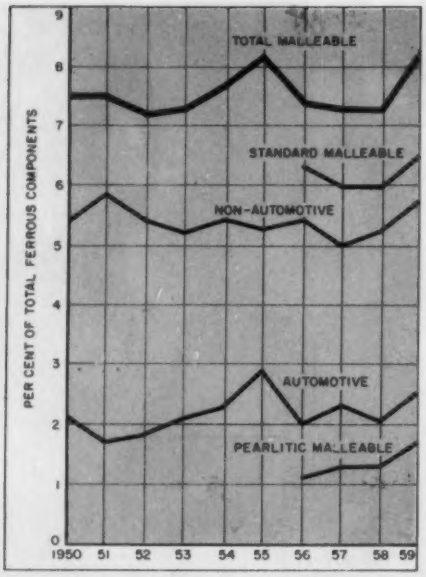


Fig. 1—Plot shows yearly percentage of the ferrous component market represented by malleable castings. Note 1959 upturn. Statistics on pearlitic malleable were first reported in 1956

MARKETING PROGRAM

. . . Brings Results for Malleable

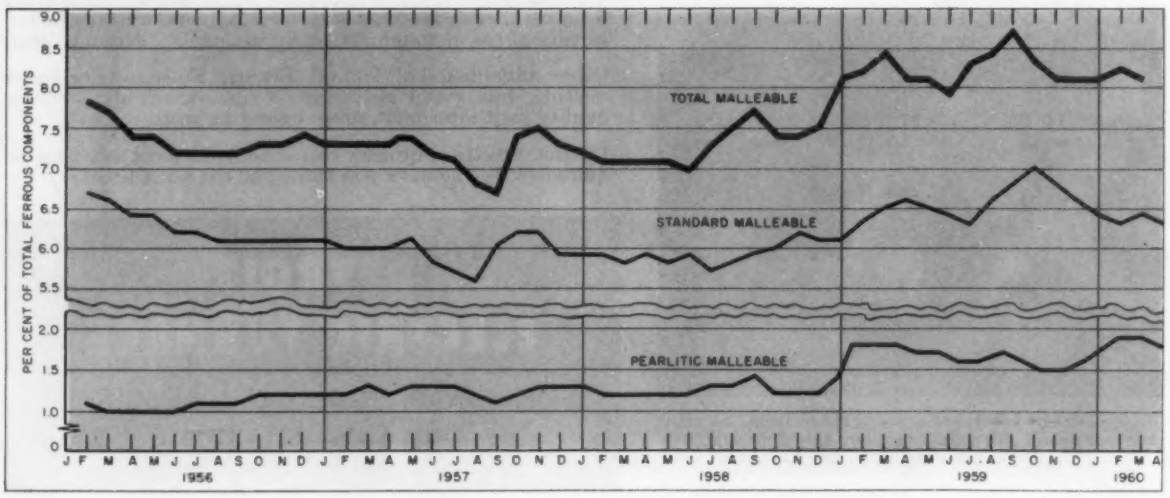
● DURING THE LAST few years, the Malleable Founders Society and the Malleable Castings Council have devoted a great deal of time and effort to better marketing for the malleable industry's products. The Malleable Founders Society has conducted Market Development Conferences for 11 years. Sales clinics are held periodically, direct mail has been used for a number of years, and recently a public relations director was added to the society staff.

In addition, the Malleable Castings Council was formed two years ago to create a substantial business publication advertising program.

To appraise those activities, a comparison of malleable production to other, competitive ferrous materials has been developed. Yearly tonnages were totaled for steel forgings, steel castings, nodular iron castings, miscellaneous gray iron castings (excluding pressure pipe and fittings, molds for heavy steel ingots, and chilled iron railroad car wheels), and malleable. From these figures, a "share of the market" percentage for malleable was computed as shown in Fig. 1. The total of malleable castings production shows a somewhat stable performance from 1950 to 1958, with the exception of 1955, the record automotive year. When total malleable is separated into automotive and nonautomotive, nonautomotive malleable shows a slight downtrend until 1958, when the swing reverses. The automotive sector shows a generally slight increase, with a large increase during the very fine year 1955.

Another interesting breakdown concerns the relative position of standard malleable and pearlitic malleable. Only the years 1956-1959

Fig. 2—Chart shows monthly figures for malleable castings as a percentage of ferrous components. In tons, demand for ferrous components is in a declining trend. Thus malleable producers will need a bigger share of the shrinking market to maintain 900,000 to 1,000,000-ton production range



NOTE to CO_2 PROCESS USERS

Photograph of 250 lb. pure copper 7" diameter electrode holders. Produced for Whiting Corporation by A. W. Cadman Manufacturing Company. PARASET used exclusively.

PARASET CO_2 BINDER

PERFORMANCE APPROVED

COPPER CASTINGS The A. W. Cadman Mfg. Co. produces copper castings ranging in size from 50 to 3500 lbs., usually with either a seamless or monel cooling coil cast integrally. In using the CO_2 process, of the many binders available, Alex M. Cadman, Jr. uses Paraset for producing all cores and molds. Reason: "We have to be sure that our molding is perfect, in order that we do not scrap a very expensive monel cooling coil."

OTHER METALS Equally advantageous in gray iron, aluminum, brass and bronze foundries, Paraset has received these user reports: ". . . increased production", ". . . better collapsibility" and ". . . finer finish."

NEW!

CO_2 SHELL COAT

the liquid resin way to better collapsibility

Provides surface strength; seals surface from moisture gain or loss from heat and humidity. Prevents loss or damage in handling—stops surface friability from developing in storage. Permits improved shakeout, better casting finish. Good results for resin bonded cores.

For Economy and Best Collapsibility . . . Specify Paraset and CO_2 Shell Coat

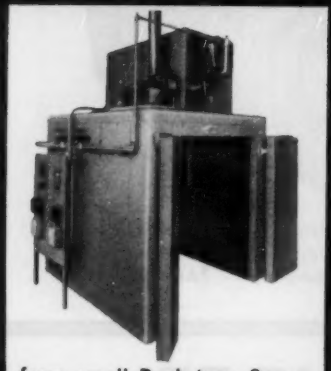
FOR MORE INFORMATION ON THESE, AND OTHER PARA PRODUCTS, WRITE

PARA PRODUCTS DIVISION

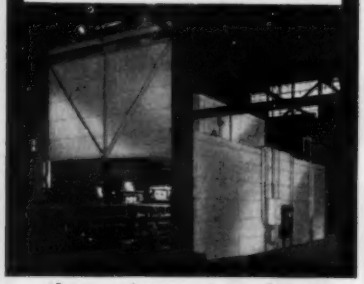
FOUNDRY RUBBER INCORPORATED

Dept. S—5200 River Road Washington 16, D. C.

LANLY heat processing equipment for the FOUNDRY INDUSTRY



from small Rack type Ovens to the BIG CAR TYPE OVENS



If a need arises to replace or improve your Foundry Ovens, it is only logical to look to LANLY, recognized authorities in the design and construction of heat processing equipment for more than 22 years.

TODAY may be the opportune time to survey your present facilities and request the counsel of a LANLY representative at no obligation.

THE Lanly CO.

FOUNDRY OVENS 2800 Euclid Avenue • Cleveland 15, Ohio

write for FREE bulletin

Find Your Representative in The Yellow Pages

Atlanta, Georgia Birmingham, Ala.
Boston, Mass. Chicago, Ill. Cleveland, Ohio
Columbus, Ohio Detroit, Mich.
Rochester, N. Y. Pittsburgh, Pa.
San Francisco, Calif. St. Louis, Mo.

Circle 672 on Page 55

Malleable Castings Council won the premier award for an advertising campaign in business publications in a contest sponsored by the National Advertising Agency Network. The business publication category had 306 entries. The council campaign, which has been running during the last two years, has been most successful in producing inquiries. A recent tabulation of reports by member company salesmen doing follow up work on these inquiries showed that 56 per cent have some potential for present or future business

are reported in government statistics on pearlitic malleable. Standard malleable's downslide was halted, and a turnaround developed quite favorably in 1959. Pearlitic malleable showed a sizable increase in its relative position in 1959.

The monthly figures, Fig. 2, show this trend even more clearly. The trend was slightly down in standard malleable from 1956 until late in 1958, when the situation turned. Standard malleable shows a definite downtrend, whereas pearlitic made slight increases, with the net effect of a slight downtrend in the total. Both types turned up sharply in late 1958 and early 1959.

This total market for ferrous components, however, is in a decline in terms of total tons. The net effect of this situation is that malleable must obtain a larger share of a smaller market just to "stay even" on a tonnage production basis.

These particular materials were chosen as representing "prime competition" for which figures are available, and they have similar marketing situations.

The improvement in malleable's relative position is due to the increased emphasis promotion has at the industry level—through the Malleable Founders Society and the Malleable Castings Council and, more importantly, through increased sales effort at the individual company level.

According to Lowell Ryan, executive vice president, Malleable Founders Society, the industry has about an 18-month *lead* over its "prime competition," but it is not long, and it is not much. It will take major marketing efforts just to keep industry production in the 900,000 to 1,000,000-ton range. It is possible to increase the total tonnage, but it will require a lot more dollars than are now being spent on industry promotion and company sales efforts.

One factor that has decreased malleable tonnages is the ability of designers and engineers to produce stronger, lighter malleable parts through better design. Although on a given component, the number of castings used may be the same, they will not represent as many pounds as they did ten years ago.

Book Review

Foundry Radiation Protection Manual, **cloth, 60 pages, 8¼ x 11¼ in., published by the American Foundrymen's Society, Des Plaines, Ill. Price $9.**

Opening with a discussion on the nature and sources of radiation in the foundry, the book presents in logical sequence detailed information on the health aspects of radiation; control of radiation in the foundry; radiation detection instrumentation; protection by time, distance, and shielding; and procedures for handling and use of sources of radiation.

The book provides basic information on characteristics of radiation, and biological and medical information. Specific details and procedures required for installation of a radiological-safe radiation facility are presented. Various types of radiation detection instruments and their applications are described.

Basic laws and data required for determining specific applications of protective shielding are given, and handling and use of radiation sources are discussed. The book concludes with a glossary of terms used in the field.

they work fast, wear slow,

to keep your grinding costs in line

SIMONDS SNAGGING WHEELS

Remove stock *fast* . . . with less wheel wear! You can, with Simonds Snagging wheels. They're made to give you that economy from job to job, from order to order. Resinoid bonded wheels have special additive for improved grinding on steel castings and annealed malleables. Vitrified bonded wheels for uniformly efficient action on gray iron castings, unannealed malleables, brass and bronze. Order from your Simonds distributor.

Send for Bulletin ESA 305

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COUNT ON / YOUR SIMONDS DISTRIBUTOR
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SHREVEPORT — IN CANADA: GRINDING WHEELS DIVISION, SIMONDS CANADA SAW CO., LTD., BROCKVILLE, ONTARIO • ABRASIVE PLANT, ARVIDA, QUEBEC

Literature for Foundrymen

For More Information Use Reader Service Card—Page 55

Aluminum Fluxes

Covering and protective fluxes for aluminum and its alloys are described in a four-page brochure along with properties and uses.—**Foundry Services Inc.**, P. O. Box 8728, Cleveland 35, Ohio.

For More Details Circle No. 406—Page 55

Skip Hoists

Bulletin 110 describes fully and semi-automatic, electrically operated skip hoists.—**C. O. Bartlett & Snow Co.**, 6200 Harvard Ave., Cleveland 5, Ohio.

For More Details Circle No. 407—Page 55

Thermocouples

Construction of Armorox thermocouples is explained and typical applications are listed in Bulletin P1281A. Complete specifications of the thermocouple line are tabulated.—**Bristol Co.**, P. O. Box 1790, Waterbury 20, Conn.

For More Details Circle No. 408—Page 55

Tractor Crane

Brochure gives advantages of Go-Devil Model 20RM2 tractor crane. Specifications are included.—**Drott Mfg. Corp.**, 3126 27th St., Milwaukee 15, Wis.

For More Details Circle No. 409—Page 55

Moisture Control System

Data on company's new sand moisture control system is available with a schematic drawing of the unit.—**Jem Laboratories Inc.**, 522 W. 36th St., Ashtabula, Ohio.

For More Details Circle No. 410—Page 55

Mold Release Oils

Bulletin contains data on three mold release oils for zinc and aluminum die-casting.—**Sun Oil Co.**, Industrial Products Dept., 1608 Walnut St., Philadelphia 3, Pa.

For More Details Circle No. 411—Page 55

Blasting Equipment

Illustrated Bulletin HPB 60-1 is devoted to wet and dry abrasive blasting equipment, accessories, and supplies.—**Hydra-Blast and Power-Blast Mfg. Div., Automation Services Inc.**, Detroit 38, Mich.

For More Details Circle No. 412—Page 55

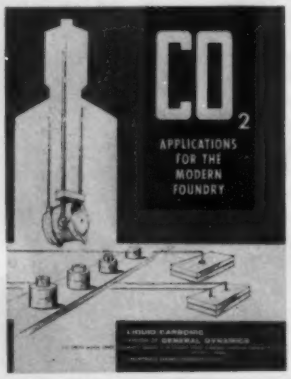
Mischmetal

Data are presented in "Recommended Additions of CerAlloy 100 (Mischmetal) in Precision Castings" to improve fluidity of ferrous and nonferrous casting alloys.—**Cerium Metals and Alloys Div., Ronson Metals Corp.**, 45-65 Manufacturers Place, Newark 5, N. J.

For More Details Circle No. 413—Page 55

CO_2 Process

Gassing equipment is described and new core and binder formulas are given in booklet, "CO_2 Applications for the Modern Foundry."—**Liquid Carbonic, a division of General Dynamics Corp.**, Dept. F, 135 S. LaSalle St., Chicago 3, Ill.



For More Details Circle No. 414—Page 55

Vibrating Feeders

Motorized counterweight feeders are illustrated in Book 2869, "MC Vibrating Feeders."—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 415—Page 55

Did You Miss These?

Here is a list of popular literature items offered in recent months:

CASTING MACHINES (Bulletin 160)—Centrifugal Casting Machine Co., Tulsa, Okla. Circle 402, Page 55.

MELTING FURNACES (Bulletin 591)—Hevi-Duty Electric Co., division of Basic Products Corp., Milwaukee 1, Wis. Circle 403, Page 55.

ALUMINUM JOINING — All-State Welding Alloys Co., White Plains, N. Y. Circle 404, Page 55.

RUST and CORROSION CONTROL ("Color Horizons") — Rust-Oleum Corp., Evanston, Ill. Circle 405, Page 55.

Solenoid Air Valves

Eight-page pamphlet, Bulletin 320, covers line of solenoid air valves with dimensional data and specifications.—**Ross Operating Valve Co.**, 120 E. Goldengate Ave., Detroit 3, Mich.

For More Details Circle No. 416—Page 55

Tractor Loaders

Bulletins MS-1373 and MS-1386 describe TL-14 and TL-12 tractor loaders.—**Construction Machinery Div., Allis-Chalmers Mfg. Co.**, 1126 S. 70th St., Milwaukee 1, Wis.

For More Details Circle No. 417—Page 55

Lubricating Equipment

Catalog X-135 lists lubricating equipment including oil cups, oiling systems, dispensers, valves and flow indicators, oil gages, and other equipment. Drawings and specification tables are included.—**Oil-Rite Corp.**, 2387 Waldo Blvd., Manitowoc, Wis.

For More Details Circle No. 418—Page 55

Melting Furnaces

Bulletins 102, 103, and 104 describe single-burner stationary crucible furnaces, crucible aluminum furnaces, and tilting crucible furnaces, respectively.—**Campbell-Hausfeld Co.**, Harrison, Ohio.

For More Details Circle No. 419—Page 55

First Aid Kits

Four sizes of first aid kits are described in Bulletin 0401-10.—**Mine Safety Appliances Co.**, 201 North Braddock Ave., Pittsburgh 8, Pa.

For More Details Circle No. 420—Page 55

Surface Thermometers

Leaflet illustrates surface thermometer and suggests applications. Several heat ranges are available.—**Pacific Transducer Corp.**, 11836 W. Pico Blvd., Los Angeles 64, Calif.

For More Details Circle No. 421—Page 55

Ultrasonic Flaw Detector

Ultrasonic flaw detection is the subject of Bulletin T200. The 8-page, illustrated bulletin lists specifications and advantages of the Sonoray 5 flaw detector.—**Branson Instruments Inc.**, 40 Brown House Rd., Stamford, Conn.

For More Details Circle No. 422—Page 55

Mechanical Deburring

"Mechanical Deburring News" describes and diagrams four methods of mechani-

30 TO 40 MINUTES LESS OVEN TIME IS ONE ADVANTAGE...

BUT FAST-BAKING CORE OIL HELPS YOU IN OTHER WAYS!

The really important benefit is in better-baked-cores . . . cores that are baked clear through! *Plus* the advantages of lower gas content, better workability, harder and stronger cores, improved collapsibility.

"WERSMITH" fast-baking core oils are stronger-binding than most conventional core oils and, therefore, can be used in leaner ratios, for lower costs. They produce stronger cores, with fewer cracks, less breakage in handling — which means minimum loss from core defects.

Cost is not high! "WERSMITH" fast-baking core oils cost only **11.9¢** to **14.7¢** per pound in drums, FOB Cleveland. This is a lower cost than that of many conventional core oils that won't do as much for you!

These new, improved core oils can better your production and reduce costs. Let us know your problems and conditions. Our recommendations, plus a trial drum *"on approval"*, may bring you the performance and savings you are seeking. Write, wire or phone, today!

WERNER G. SMITH, INC.

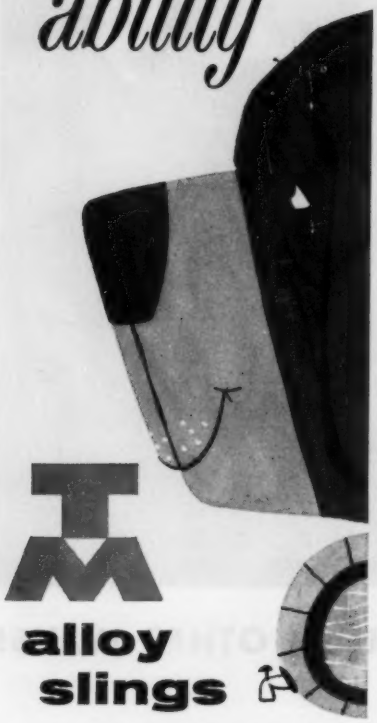
1730 TRAIN AVE., CLEVELAND 13, OHIO • PHONE: TOWER 1-3676

"WERSMITH" CORE OILS COST LESS TO BUY...COST LESS TO USE

Circle 674 on Page 55

VALUED FOR

Depend-ability



TM alloy slings

TM Alloy Slings have a reputation for dependability . . . brute strength and low overall costs. Factory-made. Certificate of Test furnished. Bulletin 14A contains all data. Call your distributor, steel warehouse, hardware wholesaler or write—

S. G. TAYLOR CHAIN CO., Inc.
Plants: Hammond, Indiana
3505 Smallman St., Pittsburgh, Pa.

Prompt repairs on alloy slings in both plants.

Taylor Made CHAIN SINCE 1873

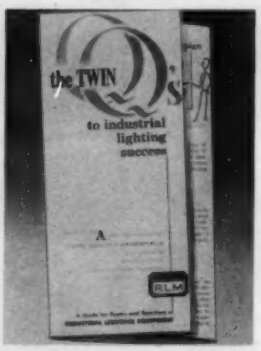
Circle 675 on Page 55

cal deburring with examples of application in the form of case histories.—**Wheelabrator Corp.**, 1102 S. Byrkit St., Mishawaka, Ind.

For More Details Circle No. 423—Page 55

Industrial Lighting

Six-page "Twin QQ Answer Guide" reviews factors related to proper selection



of lighting equipment.—**RLM Standards Institute**, 326 W. Madison St., Chicago, Ill.

For More Details Circle No. 424—Page 55

Flaw Detector

Leaflet describes Mark 5F ultrasonic flaw detector. Typical applications and specifications are discussed.—**Princeton Div., Curtiss-Wright Corp.**, Princeton, N. J.

For More Details Circle No. 425—Page 55

Diecasting Machines

Sixteen-page Bulletin 6000 describes entire H-P-M line of press equipment for pressure processing, including Cast-Master diecasting machines.—**Hydraulic Press Mfg. Co.**, division of Koehring Co., Mount Gilead, Ohio.

For More Details Circle No. 426—Page 55

High-Alloy Castings

Twelve-page booklet, "Technical Publications List," catalogs 46 technical papers, reprints, and data sheets on stainless and heat resistant castings.—**Alloy Casting Institute**, 1001 Franklin Ave., Garden City, N. Y.

For More Details Circle No. 427—Page 55

Manual Welding Equipment

Sigmatic manual welding equipment is described in Catalog F-1393, which covers welding machines, torches, and controls for consumable electrode, inert-gas-shielded welding.—**Linde Co.**, division of Union Carbide Corp., 420 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 428—Page 55

Compressed Gases

Catalog gives prices and data on 85 compressed gases and gas mixtures, plus line of gas regulating and handling equipment.—**Matheson Co.**, East Rutherford, N. J.

For More Details Circle No. 429—Page 55

Protective Coating

Leaflets give information on Zincilate 810, a protective coating designed to replace galvanizing.—**Industrial Metal Protectives Inc.**, 401 Homestead Ave., Dayton 8, Ohio.

For More Details Circle No. 430—Page 55

Overhead Cranes

Booklet shows various overhead cranes and their uses. A specifications list is included for all models available.—**Milwaukee Crane Div., Novo Industries Corp.**, 3271 E. Van Norman Ave., Cudahy, Wis.

For More Details Circle No. 431—Page 55

Potentiometers

Folder presents line of laboratory and testing equipment including specifications and application information on portable potentiometers.—**Leeds & Northrup Co.**, 4934 Stenton Ave., Philadelphia 44, Pa.

For More Details Circle No. 432—Page 55

First Aid Training

Realistic aids for first aid training are described in sixteen-page Bulletin 31. Equipment simulates wounds, fractures, asphyxiation, and shock.—**Alderson Research Laboratories Inc.**, 48-14 33rd St., Long Island City 1, N. Y.

For More Details Circle No. 433—Page 55

Ferroalloy Briquets

Eight-page brochure entitled "Ferro-Alloy Briquets for the Iron Foundry" dis-

cusses company's identification system in which briquets are coded by shape as well as by color.—**Ohio Ferro-Alloys Corp.**, Canton, Ohio.

For More Details Circle No. 434—Page 55

Induction Motors

Selection, application, and buying guide, Bulletin GEC-1049, includes basic information needed by motor users. Charts, tables, and ratings are included.—**General Electric Co.**, Schenectady 5, N. Y.

For More Details Circle No. 435—Page 55

Centrifugal Fans

Catalog 1120-1, "All Purpose Centrifugal Fans—Series 3000," contains tabular performance data and dimensions for AMCA Class 1, 2, and 3 fans. The booklet also

I'm *Soffel's* Red Devil Thermotomic HoTop

I'll pump all the metal you can pour... 24 hours a day... the hotter—the better!

A demonstration will show you how effectively you can cut costs & increase yields

Reduce the size of your heads and let Soffel's Red Devil Thermotomic Hotop keep that reduced amount of metal in the heads liquid so you will gain *more* sound, shrink-free castings from every ladle of metal poured.

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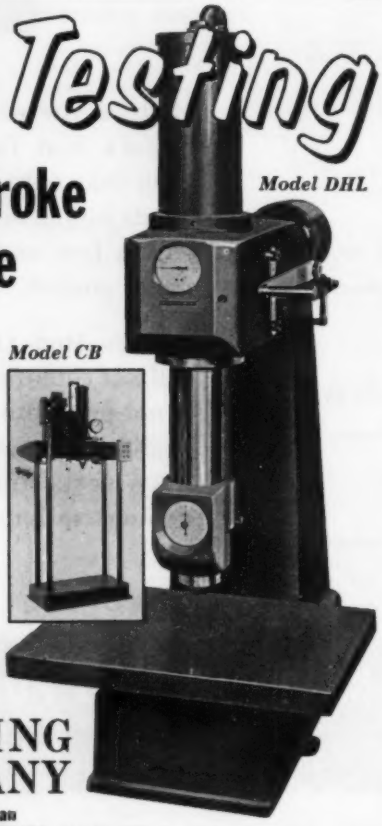
Circle 677 on Page 55

Faster Testing

with a long-stroke Brinell machine



Model DHL

Model CB

Faster hardness testing is yours when you use a Detroit long-stroke testing machine. The long-stroke test ram does the adjusting to various work piece heights, and does it fast. Constant height table always matches conveyor height, too. Hydraulically operated, with or without direct reading dial (shown with). Larger and special machines made to order.

Write today for information about our Brinell and other testing machines

DETROIT TESTING MACHINE COMPANY

9382 Grinnell Avenue, Detroit 13, Michigan
(SEE US AT BOOTH 1946 AT THE METAL SHOW)

Circle 678 on Page 55

lists a number of applications.—Westinghouse Sturtevant Div., 200 Redville St., Hyde Park 36, Mass.

For More Details Circle No. 436—Page 55

Industrial Truck Batteries

Brochure of 24 pages describes type "Thirty" batteries to be used in industrial trucks. Battery selection charts with capacities and outside dimensions are included.—Gould-National Batteries Inc., Trenton 7, N. J.

For More Details Circle No. 437—Page 55

Resin Coated Sand

Brochure describes Faskure resin coated sand for shell cores and shell molds.—Faskure Coated Sand Div., Aurora Metal Co., 614 W. Park Ave., Aurora, Ill.

For More Details Circle No. 438—Page 55

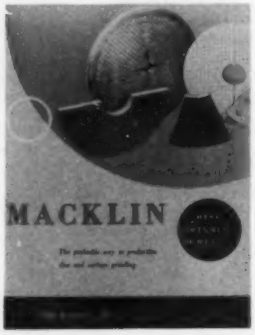
Crawler Mounted Crane

Bulletin 26751-O describes ¾-yd, crawler-mounted Lorain Model 26. Booklet gives details of machine's construction and job applications for use as shovel, crane, or magnet.—Thew Shovel Co., Lorain, Ohio.

For More Details Circle No. 439—Page 55

Disc Grinding Wheels

Four-page color brochure illustrates disc



grinding wheels—Macklin Co., Jackson, Mich.

For More Details Circle No. 440—Page 55

Dust Collector

Details are given on reverse-jet fabric dust collector in eight-page brochure.—American Air Filter Co., Louisville, Ky.

For More Details Circle No. 441—Page 55

Vibrating Conveyors

Catalog 954 lists various models of mechanical vibrating conveyors and their applications.—Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, Ohio.

For More Details Circle No. 442—Page 55

Industrial Truck

Model F-50T7 industrial truck, with 7000-lb capacity, is featured in 4-page folder.—Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, Ohio.

For More Details Circle No. 443—Page 55

New from Wright!

Built-In Overload Protection for Operator, Load and Hoist with the New Wright Overload Cutoff*!

• Now, for the first time on any electric hoist, you can have safe, sure, mechanical overload protection as a built-in feature with the **WRIGHT Overload Cutoff.** Designed and built to fit any new WRIGHT *Speedway* Electric Hoist, the Overload Cutoff unit you see pictured above is a compact, integral part of the hoist frame itself. As a result, it becomes a functional part of the hoist *at no sacrifice in headroom.* The WRIGHT Overload Cutoff is simple in design and should give dependable, trouble-free operation during the entire life of the hoist under normal operating conditions. Calibrated and sealed at the factory for the user's protection, the unit takes rugged abuse up to the critical point of overload—then instantaneously "breaks" the raising circuit of the hoist. This allows the load to be safely lowered to the floor and unhooked. Once this is done, the raising circuit of the hoist is again automatically restored.

The WRIGHT Overload Cutoff is available now as standard equipment on all new WRIGHT Frame 2 & 3 *Speedway* Electric Hoists, and as optional equipment on new Frame 1 & 1½ models.

Find out how WRIGHT *Speedway* Hoists equipped with Overload Cutoff can bring practical, fast-acting overload protection to your material handling operations. For complete information, write our York, Pa., office.

*Patent applied for

***See your WRIGHT Distributor** about the Speedway Electric Hoist line or write us for Catalog E-58*

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ACCO

Circle 679 on Page 55

Typical castings which are cleaned in the combination core knockout and blast cleaning machine at T. McAvity & Sons Ltd., St. John, New Brunswick, Canada

Combination Unit

CUTS CLEANING COSTS

● INADEQUATE cleaning room capacity used to be a problem at T. McAvity & Sons Ltd., St. John, New Brunswick, Canada, which produces the bulk of its gray iron castings with large, internal cores.

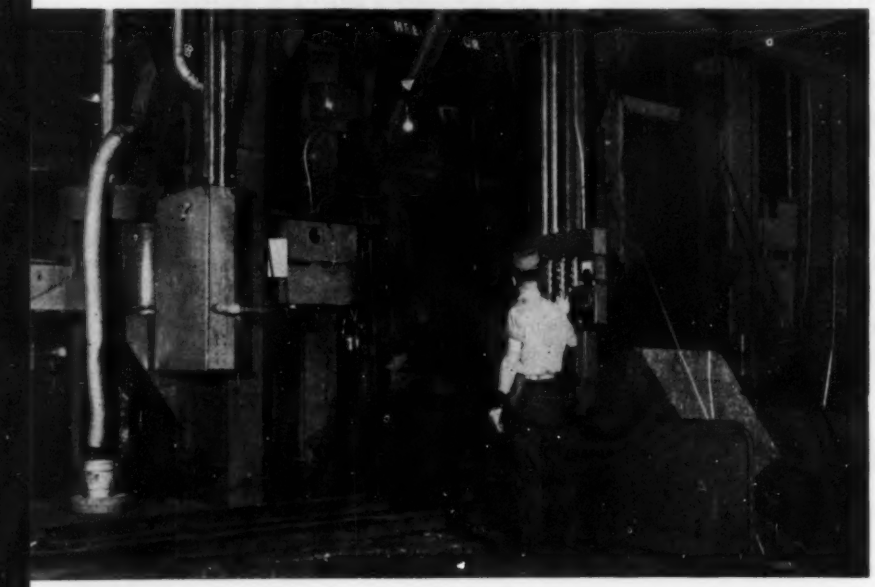
Core knockout and blast cleaning were separate operations because blast equipment could not handle the heavy sand loads which resulted when large castings were cleaned while they still contained the sand cores. Because even a small concentration of sand in the abrasive creates rapid wear of the blast wheel and other machine parts, it is important that all sand be removed from the abrasive circulating through the blast machine.

Savings in Cleaning Time on Various Castings

Part	Total Weight, lb	Previous Time, Minutes		Present Time, Combined Operation	Time Saved, Minutes
		Knock-Out	Cleaning		
Assorted small castings	2500	5	12	13	4
Seven hydrant bodies	1750	70	56	13	113
Twenty-four 4" valve bodies ..	1560	36	24	13	47
Two 12" valve bodies	980	12	22	13	21
One 18" valve body	1080	20	19	13	26
One 14" valve body	530	20	16	13	23

To speed up operations, McAvity & Sons purchased a combination machine which performs both core knockout and blast cleaning. This unit, a product of Wheelabrator Corp., Mishawaka, Ind., includes a newly developed abrasive separator which can handle sand loads and permits core knockout and blast cleaning operations to be performed by the one machine. The separator is used with a double-elevator system with two abrasive cycling systems. Consequently, only clean abrasive is circulated through the blast wheel.

The blast machine has a 22-cu-ft operating load capacity and handles gray iron castings weighing from about 1 lb to 1080 lb each. Normally, the concentration of core sand from these castings would be



◀ Combination core knockout and blast cleaning machine has a capacity of 22 cu ft and double abrasive cycling system

EVERY little pig goes to Market

No little pig stays home—for some other purpose. The entire production of Interlake's famous Meltrite pig iron is for sale.

This means you can always count on Meltrite. It is in dependable supply at all times ...a key reason why foundries use more Meltrite than any other merchant pig iron.

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Wherever you are, a PM & Company Metallurgist is ready to talk with you about *"Controlled Cupola Charge" and how it can help you make better profits. Let us hear from you—no obligation.

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Circle 680 on Page 55

extremely difficult to remove from the abrasive stream and would result in greatly accelerated wear. Experience at McAvity & Sons, however, shows that blade life is averaging better than 100 hr per set.

The combination machine replaced a smaller batch-type cleaning mill and an airblast room. The latter now is used only occasionally to clean castings too large to be handled in the blast machine. As a result, savings were effected by a 50 per cent reduction of direct labor previously required for the blast mill and an 87 per cent labor reduction in the airblast room operation—a total saving of 150 man hours per week.

Four men formerly were required for core knockout and the operation of the blast mill. Two men now are handling this work with the new machine. Whereas the airblast room was operated two full shifts daily, it now is used not more than two hours daily.

The core knockout and blast cleaning cycle is controlled by a sequencing timer. It makes possible variable time settings.

Cooled castings are loaded in the same manner as in a standard blast machine and are tumbled for a predetermined time to loosen the cores and excess sand. During this period, sand is circulated through a by-pass abrasive system.

The wheel then is activated briefly to knock out the remaining cores and remove the heavy sand. This operation introduces a heavy surge of sand into the by-pass abrasive system. Sand not removed by the first pass through the separator is recirculated for further air washing.

When the core knockout blast has been completed, the contaminated abrasive continues to cycle through the by-pass abrasive system until all sand and contaminants have been removed. At that time, a valve closes and the abrasive begins to circulate in the regular abrasive cycle. After the cleaning cycle has been completed, the castings are tumbled for a period of time to drain all abrasive.

Besides saving on time, manhours, and maintenance of only one machine, McAvity & Sons has achieved better cleaning than before. Table I shows some typical savings. Surface finish on castings formerly cleaned in the airblast room is considered to be 90 per cent better, and on castings previously cleaned in the old batch blast mill, finish is 30 per cent better. The machine uses steel shot at a rate of only 12.4 lb per wheel-hour. Because floor space at this plant was at a premium, the space released by this installation has readily been put to profitable use.

Book Review

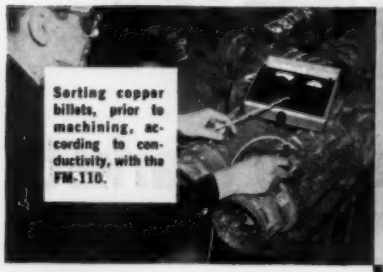
The Embattled Executive, hard cover, 94 pages, 9 x 6 in., published by the American Management Association, 1515 Broadway, New York 36, N. Y. Price $1.95 (AMA members $1.25).

This book is designed to emphasize humorous aspects of the executive's problems, each of which is illustrated with a cartoon. Activities reviewed include reading reports, participating in a conference, predicting sales, making decisions, giving speeches, staying healthy, and other problems.

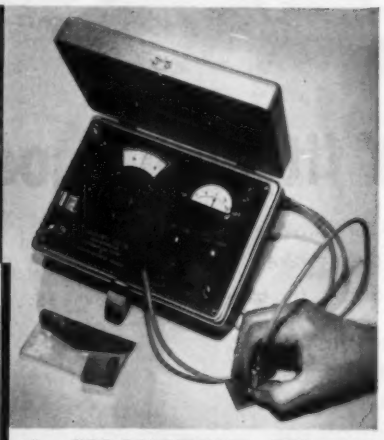
New fully portable ALL-TRANSISTORIZED BATTERY-POWERED

ELECTRICAL CONDUCTIVITY METER

Now you can use conductivity instantly to measure hardness, alloy content, sort mixed materials,— on practically ANY NONMAGNETIC METAL.



Sorting copper billets, prior to machining, according to conductivity, with the FM-110.



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STAINLESS STEEL • COPPER • MAGNESIUM • BRASS • BRONZE • LEAD • SILVER or other nonmagnetic metals . . .
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EVALUATE material alloy, hardness, uniformity of heat treat, as directly rated to conductivity

SORT mixed nonmagnetic metals

MEASURE ABSOLUTE CONDUCTIVITY of electrical hardware and components

CHECK AGING OF ALUMINUM ALLOYS — 100% at high speed

TEST TENSILE STRENGTH OF aluminum by conductivity

MEASURE COATING THICKNESS and clad side of sheets

ALSO TO: determine phosphorous content in copper, measure thermal conductivity as function of electrical conductivity, detect fire damage to aircraft surfaces and structures by change in conductivity in heat-affected zones.

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$875.00 Complete

F. O. B. our plant, Chicago. Local, sales or use tax extra. Continental U.S.A. and Hawaii only. Price subject to change.

- Weighs only 4½ lbs.
- Accuracy proved in service to better than ±3% of scale reading.
- Operates up to 350 hours or more on two flashlight batteries.

New, practical, money-saving uses for the FM-110 are being found continuously. Where can it help you? Phone our local field engineer or write Magnaflux Corporation, 7350 W. Lawrence Ave., Chicago 31, Illinois.

*Magnatest is a registered U.S. Patent Office trade mark of Magnaflux Corporation for its electrical instruments for testing metallic and conductive objects. THE FM-110 is based upon designs of Institut Dr. Foerster, Reutlingen, Germany.

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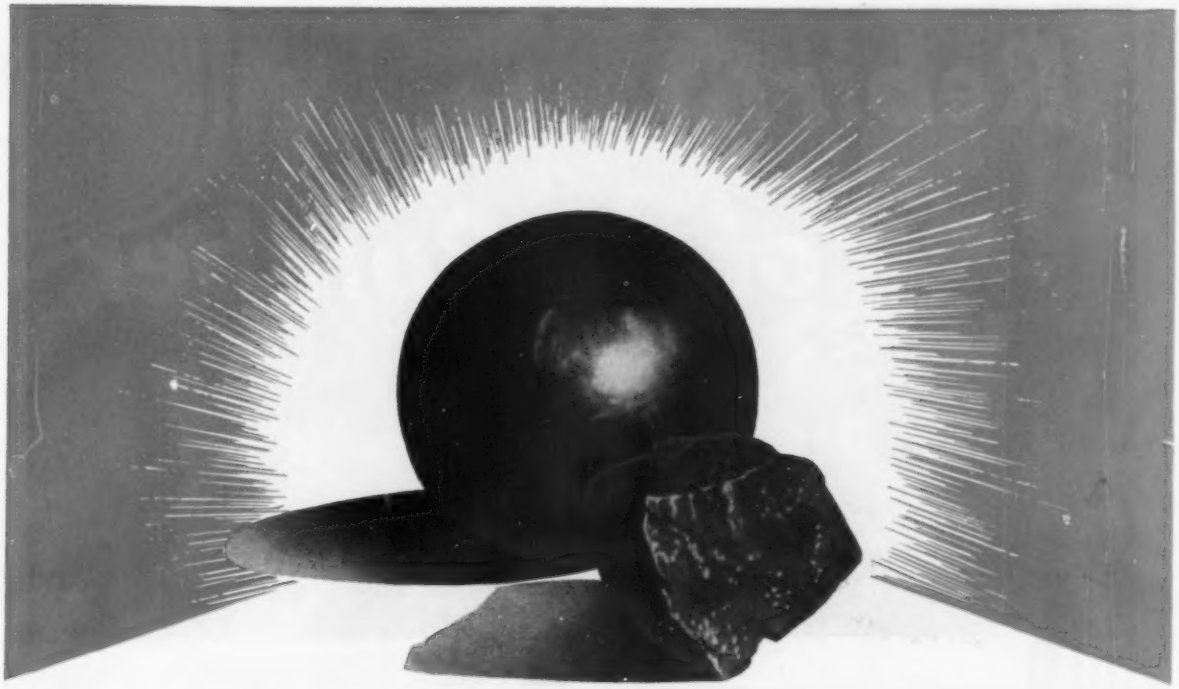

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Product of 53 years Shot Making Experience and 23 years of sponsored industrial research

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An *entirely new* metal abrasive*—a metal transformation never before supplied in the form of shot and grit, and made by new methods never before used for making metal abrasives.

That's GLOBITE—perfected after 2 years intensive research working with a team of expert metals research scientists having at their command all the facilities of one of the world's largest industrial research organizations, famous throughout the metal working industry.

GLOBITE has the hardness range, toughness and resistance to breakdown of higher priced steel abrasives, and sets new standards of low cost blast-cleaning in comparison with lower priced metal abrasives, of other types.

GLOBITE is part and parcel of today's world advance in science, applied to the improvement of metal abrasives. It sets new marks for other abrasives to follow. Be among the first to benefit from GLOBITE. Write us.

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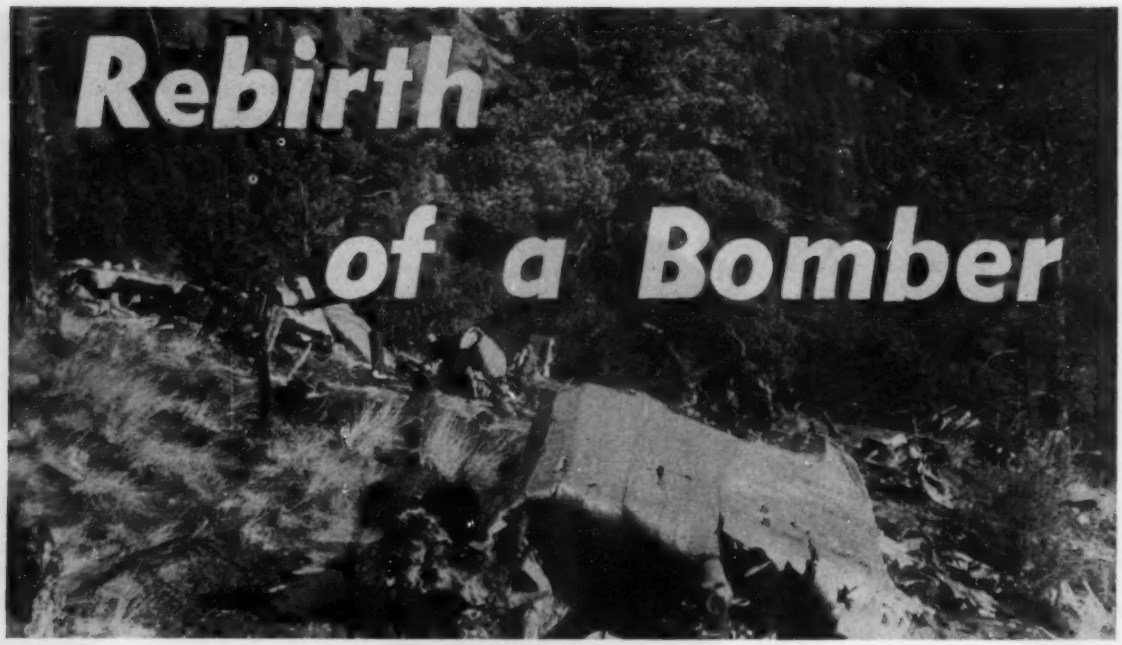
MANSFIELD, OHIO

Sold by many leading distributors of foundry supplies from coast to coast.

Circle 682 on Page 55

Rebirth of a Bomber



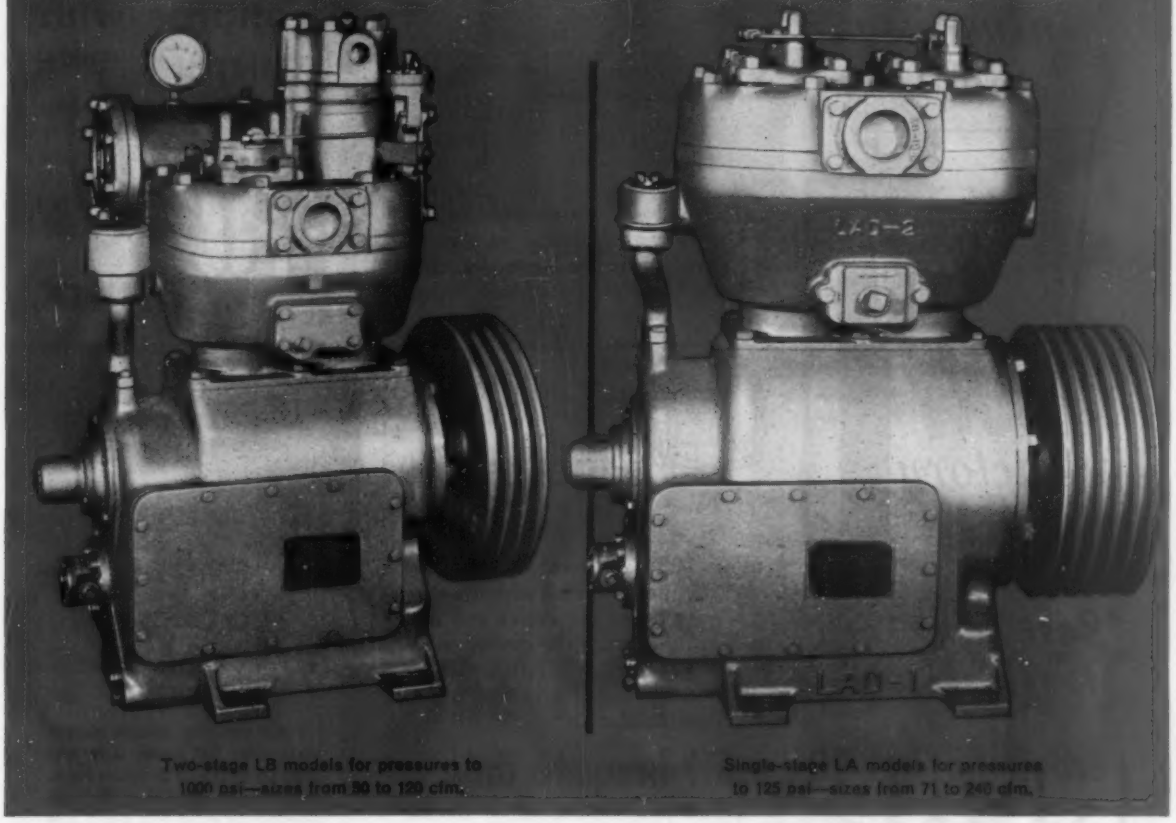
The engines and fuselage of a World War II bomber fell into a canyon after the plane had crashed against a 9000-ft ridge overlooking the Air Force Academy near Colorado Springs, Colo. Prospector Cary Crockett found the crash site while seeking an old copper deposit

This scooter is used to drag small loads of scrap metal from the bomber down an abandoned trail. The precarious path was once the pack trail of General Palmer, founder of Colorado Springs, to his private water reservoir

A propane weed burner is used to smelt the aluminum scrap in this brick-lined wheelbarrow. The improvised smelter tips forward on its axle to cast aluminum ingots. It has cast up to 1000 lb of aluminum ingots in a single day

The high alloy aluminum from the bomber is mixed carefully with more ductile ingot at Centaur Permanent Molding Co., Denver. The new alloy then is used to make such products as irrigation pipe fittings and farm and auto equipment

INTRODUCING



Two-stage LB models for pressures to 1000 psi—sizes from 50 to 120 cfm.

Single-stage LA models for pressures to 125 psi—sizes from 71 to 240 cfm.

a new line of heavy-duty
GARDNER-DENVER COMPRESSORS

50 to 240 cfm piston displacement

Here are two new, compact Gardner-Denver air compressors designed for new efficiency and durability. Engineered interchangeability simplifies parts stocking. Built for years of continuous service, they require *only* routine maintenance.

Check these improved design features

NEW water-cooling design—gives more efficient use of power.

NEW positive pressure lubrication system to main bearings and connecting rods.

NEW bearings—adjustable, tapered roller bearings.

NEW aluminum pistons—lighter mass to start and stop . . . conserve power.

PLUS all the quality engineering you've been used to in Gardner-Denver compressors for nearly 100 years.

Get the complete story on these new compressors from your Gardner-Denver representative or write for Bulletin LA-1.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

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Gardner-Denver Company, Quincy, Illinois

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Circle 683 on Page 55

HIGH
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The higher the alumina content, the better the service in a special high alumina refractory for tough applications up to 3300°F. Ironton HI-AL means longer service . . . with lower refractory cost for the life of the lining in acid electric ladles, in tapholes, electrode openings, reverberatory furnaces, for lining and patching acid electric furnaces and repair jobs.

Try HI-AL in your plant at no charge. It is available wet or dry. An Ironton engineer will supervise the first installation, and teach your men to use HI-AL economically. Write or call today.

Circle 684 on Page 55

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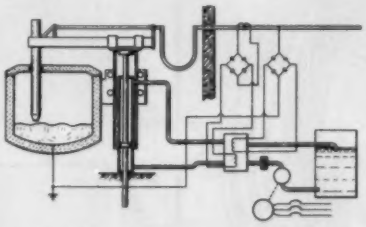
PATENTS

Of Interest to Foundrymen

Arc Furnace Control

Control system for arc furnace is designed to provide and maintain optimum arcing distance of the electrodes without "hunting." Includes reciprocating hydraulic motors to raise and lower the electrodes, electrically controlled four-way valves



to actuate the motors, and electrical systems interconnected with the electrodes to cause the valves and motors to function in the desired manner. *Patent No.* 2,921,107, *granted to L. R. Toothman and assigned to McGraw-Edison Co.*

Wear-Resistant Alloy

Aluminum bronze alloy having improved wear resistance and toughness is composed of 13.0 to 20.0 Al, 1.0 to 8.0 Fe, 1.0 to 8.0 Mn, 0.5 to 3.0 Cr, and remainder Cu. Specific composition is given as 15.0 Al, 4.25 Fe, 2.0 Mn, 1.50 Cr, and 77.25 Cu. Tensile strength is given as 90,000 psi, yield strength 75,000 psi, elongation 1.5 per cent, and Rockwell C hardness 40. Alloy employs high-quality metals and is made by use of a hardener composed of 60 Al, 8 Cu, 20 Fe, 5 Cr, and 7 Mn which is added to molten Cu. *Patent No.* 2,937,941 *granted to J. F. Klement and assigned to Ampco Metal Inc.*

Investment Material

Combination of materials for investment molding has properties of setting expansion at zero or slightly positive, low setting and curing temperature rise, tendency for separation between precoat and back-up eliminated, and good green and fired

"Toughen up" air furnace bottoms with IRONTON
AL-70
BRICK

MELTED 12,000 TONS WITHOUT A SHUT-DOWN

A large production malleable foundry's report shows that **Ironton AL-70** brick lasted 826 hours in an air furnace bottom where metal is tapped at 2830°F. With pulverized coal as fuel, 70% alumina brick stands the gaff better than any refractory used previously.

On a basis of cost per ton of metal produced, **Ironton AL-70** brick are most economical. Longer service and superior resistance to slag and metal attack help to reduce over-all costs of furnace operation. Check this opportunity for savings.

SWITCH FROM SILICA BRICK

in electric furnace roofs to **Ironton AL-70** brick. In this application, high alumina brick really cuts costs. Ask for details.

Circle 685 on Page 55

SINCE 1917 THE IRONTON FIRE BRICK COMPANY
IRONTON, OHIO

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Write or call JE 2-3621 collect
for name of area representative

Circle 684 on Page 55

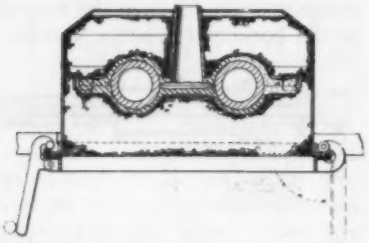
Circle 685 on Page 55

strengths. Formulation is in two phases. Liquid phase is composed of 13.2 parts by weight sodium silicate (1:3.75 ratio), 20 parts orthophosphoric acid (85 per cent), and 78 parts water.

Dry phase is composed of 4 per cent by weight fused magnesium oxide powder, 30 per cent 30 mesh silica sand, 16 per cent 50 mesh silica sand and 50 per cent 200 mesh silica sand. Liquid binder and refractory are mixed in the proportions of 23½ parts by weight of binder to 100 parts of the refractory. *Patent No. 2,928,749 granted to C. H. Watts and assigned to Pre-Vest Inc.*

Shell Mold Container

Box or container for holding shell mold for pouring includes a central flange for supporting the shell while the container is filled with sand, shot, or other backing, and a hinged cover on the bottom. Means also



are provided to rotate the box for filling. In operation, the box is located bottom up, with the cover swung out of the way. Shell mold is placed on the supporting flanges, the box filled with the backing medium, and the cover clamped in position. Box is rolled over, and the upper section filled with backing material and moved to the pouring station. After the metal has solidified, the cover is unclamped, permitting mold, casting, and backing material to fall out onto screening equipment which separates casting from mold and backing material and mold and backing from each other. *Patent No. 2,940,140, granted to V. L. Frantz.*

Spheroidal Cast Iron

Procedure for producing high-grade cast iron, particularly spheroidal cast iron, consists of blowing oxygen on the surface of molten cupola-melted iron until the silicon is reduced, preferably to 0.5 per cent, with a reduction

Low head room, single suspension hoist with motor driven trolley.

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Balanced Drive Hoists from 250 lbs. to 20 tons

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Circle 686 on Page 55

Stearns INDOX V* permanent magnet pulleys give you job-proved protection

FOUNDRY APPROVED

Stearns 15"x20" INDOX V pulley removing tramp steel from foundry sand at The Vollrath Company, Sheboygan, Wisconsin.

for example: at THE VOLLRATH COMPANY...

... Metallurgical Engineer, James Behring, states—"Our new sand reprocessing system with the Stearns INDOX pulley has substantially reduced our backup sand cost and has almost eliminated muller maintenance expense."

Mr. Behring went on to say, "In the past, most of our used sand was discarded, except where large quantities of backup sand were required for larger castings. In these cases, the larger pieces of core wire and other tramp iron which could cause damage or injury were removed by hand. When this sand was remixed in the muller, however, the smaller undetected pieces caused considerable damage to the unit's walls and mixing wheels. Now, with our new sand reprocessing system in operation, *all* used sand can be salvaged and muller damage is eliminated. The savings we've made in sand, labor and maintenance are substantial."

This application is typical of the increasing use of ceramic permanent magnet pulleys in foundry sand systems. And again — Stearns leads the field with the only *job-proved* ceramic magnet pulley — the INDOX V.

Consider these important advantages: high capacity, lower initial cost, no power expense, no chance of power failure, no need for rectifier, no moisture problem, minimum maintenance requirements — none of the inherent disadvantages of electromagnetic pulleys which were previously the standard for foundry use.

12" to 48" diameters in 2 capacities.

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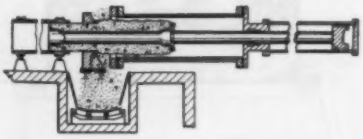
of only 0.20 per cent in carbon content. Phosphorous may be reduced by blowing in a mixture of iron oxide, lime, and calcium carbonate following the initial oxygen blow.

High-grade cast iron is made by adding silicon to the treated iron. Spheroidal cast iron is formed by addition of silicon-magnesium-iron alloy. Due to the low silicon content of the oxygen-treated iron, less difficulty is encountered from high silicon content when such alloys are used. *Patent No.* 2,937,084 *granted to Fritz Klepp and Richard Werner and assigned to Osterreichische Eisen und Stahlwerke AG.*

Mold Making Machine

Machine for producing sand molds for centrifugal casting is comprised of a cylinder lined with a flexible diaphragm, means to expand the diaphragm toward the center of the cylinder, equipment to rotate the cylinder from the vertical to the horizontal position, a strike-



off means, and a pattern attached to a ram. Vertically disposed cylinder with the pattern located centrally is filled with green sand. Air pressure is applied to the diaphragm to compress sand against the pattern. Cylinder is swung to the horizontal position, and the sand mold on the pattern is pushed out against the strike-off means, forming a true cylinder, and into a suitable flask. Pattern then is withdrawn. *Patent No.* 2,937,421, *granted to R. W. Taccone and assigned to Taccone Pneumatic Foundry Equipment Corp.*

Hard-surfacing Rod

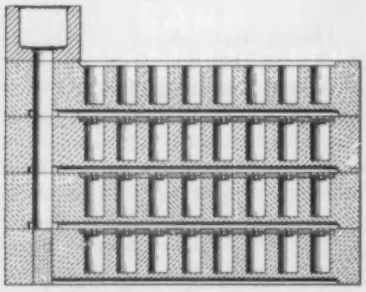
Elimination of fine hair cracks in welds made with chromium-containing alloy cast iron welding rods for hard-surfacing cast iron is claimed to be accomplished by addition of copper. Additions of molybdenum also are included to increase ability of the weld deposit to withstand stresses of wear and abrasion.

Preferred composition shows 3.40 to 3.50 C, 2.5 to 3.0 Si, 0.6 to 0.75

Mn, 0.15 to 0.35 P, 0.1 max. S, 0.6 to 1.5 Cu, 0.2 to 0.4 Cr, 0.3 to 0.5 Mo, and remainder substantially Fe. Weld deposits show a Brinell hardness of 255 to 325. *Patent No. 2,937,083 granted to R. F. Sherwin and assigned to Chicago Hardware Foundry Co.*

Stack Molding Method

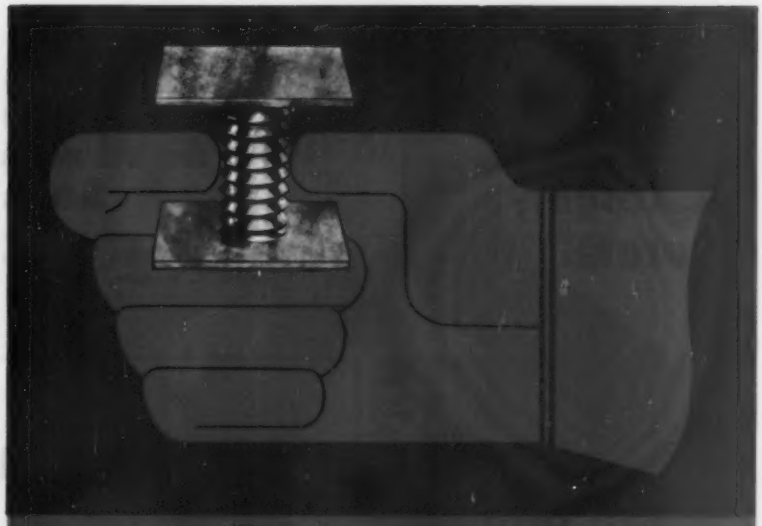
Arrangement for green sand molding of valve lifters provides a simple method for stack molding and uses small ingates into the castings. Small ingates minimize shrinkage and inverse chill and are easy to remove from the castings. Molds contain cavities for 48 castings. They are recessed on the top to receive



two core sections containing the gates, and on the bottom to provide six channels or runners to feed metal into the gates. Cores are about ¼ in. thick and contain 24 gates and heat retention areas. Latter resemble Maltese crosses or four-leaf clovers about same diameter as the casting cavity and about ⅛ in. thick. *Patent No. 2,940,142, granted M. K. Wells and W. C. Wick and assigned to Wells Mfg. Co.*

Zinc-Base Alloy

Designed for casting in sand molds to produce forming dies a zinc-base alloy is said to possess fine grain and improved impact strength. Preferred composition contains about 4.25 per cent aluminum, about 3.20 per cent copper, a trace to about 0.005 per cent magnesium, and remainder pure zinc. Final alloy is made preferably by use of a hardener alloy containing the copper and aluminum, which is added to molten zinc. Hardener alloy contains 56 to 58 per cent aluminum and 42 to 44 per cent copper. *Patent No. 2,940,846, granted to L. J. Larrieu and assigned to Morris P. Kirk & Sons Inc.*



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Circle 689 on Page 55

The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Mulling Over Sand Problems"

● MOLDING SAND, whether produced by natural or artificial means, must be recognized as a compounded material. Its performance or behavior in the foundry depends not only on the intrinsic quality of the individual elements, but on their relations to each other and on the method of mixing. Synthetic sand practice (so-called) is the practical recognition of this truth.

We have come a long way since that eventful day in 1923 when Richard Moldenke began his analyses of molding sands. Thanks to his insistent curiosity and that of Dr. Heinrich Ries, his successor, a whole school of sand technicians has come into being, each individual contributing according to his talent, opportunity, and drive.

In the lower grades of the school referred to, perhaps the title 'technician' is somewhat pretentious, for I am sure that many of us blush with assumed modesty when so addressed. We must recognize, however, that all of us who serve the foundry industry are not of the mentally elite, nor have most of us had the benefit of higher education.

We should, of course, be grateful to those of academic training who have joined forces with us and have remained undaunted by the heat and dust of this rather hectic business. Such men have contributed an incalculable measure of direct benefit and by example and encouragement have lifted those of us less gifted to a level of thought that otherwise would have been denied us.

Theory and practice do not always agree, but they are more closely related than most of us are willing to admit. Even the most ignorant man starts with some sort of hazy, undefined theory before he attempts to give material form to his thoughts. He may not be articulate, but he does possess a measure of reasoning power which can assert itself in a high degree of artistic achievement.

In the light of present knowledge, the early theories of Dr. Moldenke were questionable, but there was nothing wrong with the intelligence that prompted them. His thought about "uniform, rounded sand grains of all one size—like little marbles" was his first conception of the perfect molding sand. The move from a one-and-two-screen sand to the four-and-five-screen spread became an experience that served to widen our control.

When Harry Dietert embarked on his investigation of sand practice, seeking reasons for the success of one foundry and the mediocre results of another, designing testing instruments capable of sensitive, dependable measurement, he helped to bring about a new era in the control of the properties of molding sand. For those who saw the light, casting quality was improved, production increased, and the over-all economy of sand casting advanced.

A recent novel called *Final Diagnosis* deals with the manifold problems of a hospital and turns

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2. GET BETTER CASTING FINISH

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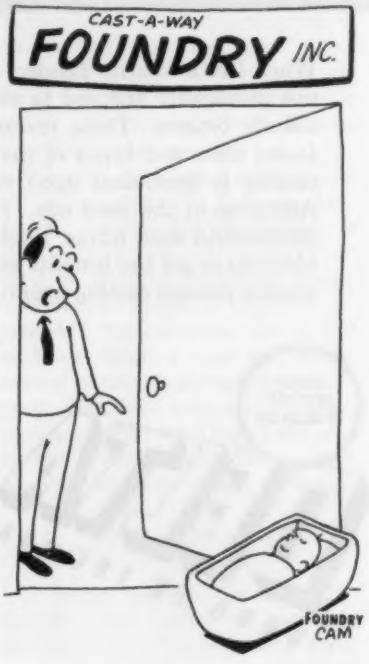
its spotlight on the pathology department. There, tests are made on living tissue to determine the exact nature of a disease and to serve as a guide to the surgeon in his operative procedure.

In the case of a growth which may be either benign or malignant, the pathologist is expected to render an accurate decision without loss of precious time. We are told that he frequently fails on both counts, due to lack of adequate facilities or technical assistance, aggravated by a backlog of pressing assignments.

Our sand technicians suffer from a similar handicap. For example, suppose that a casting is lost due to an unacceptable degree of scab or buckle, and sand failure obviously is responsible. Yet, when we ask why the sand failed, the answers are varied and extremely confusing.

To begin with, the casting was molded several days before pouring. The scab (or buckle) occurred on the cope face, which had been dried (supposedly) for four hours and subjected to another two hours of heat before closing. So we have statements, but no proof that the mold was properly dried.

The mulled facing, prepared several days prior to use, was one of 20 batches, tested at random. It is quite possible that the offending



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says Mr. S. A. Shaw, Plant Supt. of the Fahralloy Co., Harvey, Ill.

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Gravity-pitched lines allow wheeled pan pallets to roll onto the elevator at the pouring end. The operator pours at an easy variable working height and elevates the pallet to the top level for cooling.

A second elevator at the other end of this 44-ft. line provides maximum flexibility for loading, storing and removing pallets. Both pallet elevators feature smooth, shock-free cycling.

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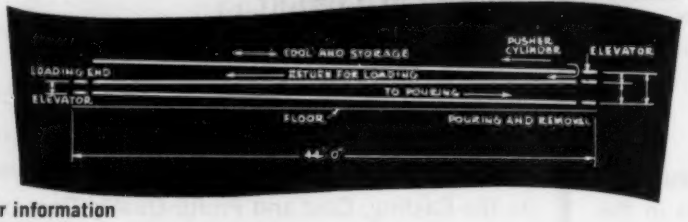

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batch had not been tested and was responsible for the scab. But inasmuch as the rest of that day's facing caused no trouble whatever, it would seem logical to investigate other leads.

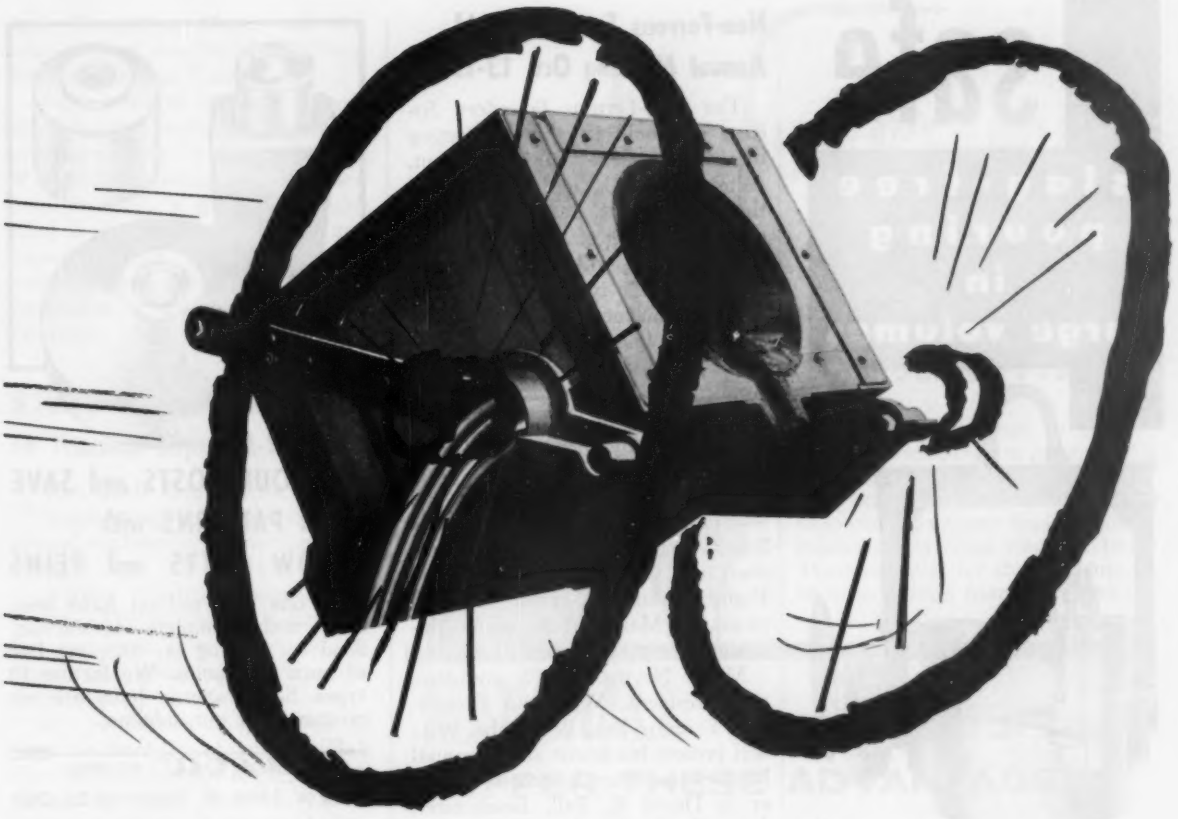
In remolding the job, we will strengthen the facing, increase drying time, and even nail the suspected surface. In all probability the second casting will be satisfactory, and everybody will be happy for awhile. But the prior failure will remain a mystery, unless repeated under more observant eyes, with the case history recorded in all of its significant detail. We, too, need a final diagnosis.

The most important technical book known to foundrymen is not printed on paper: It is the indelible mental record of past mistakes. When a foundry foreman is introduced to a new job, he has no neatly indexed card covering its case history.

He is like a blind man in a dark room searching for a light switch which isn't there. He simply doesn't know what particular technique should be employed. What sizes and types of gates and risers are to be used? What provision is to be made for the prevention of cracks, shrinkage, warpage, and other afflictions.

He must resort to his memory of past mistakes and may succeed in recalling a single instance of neglect or ignorance on a job comparable to the one he is estimating. This memory doesn't tell him what to do, but it may warn him of some of the things he shouldn't do. A bad casting becomes an expensive lesson, learned the hard way, but retained in memory long after academic precepts have been forgotten.

I'm sure that most foundries have post mortem committees which meet daily to analyze the defects of castings consigned to the furnace. These men must endeavor first to label the disease correctly, then to determine how its spread can be averted or arrested. Here we enter the realm of conjecture, and usually the man who comes up with the right answer is the one who has the longest memory—especially of past errors.



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If you'd like more information on Inductotherm furnaces, write for Bulletin 70. But, for a taste of Inductotherm service, ask to have an engineer call. Inductotherm Corporation, 412 Illinois Ave., Delanco, N. J.

INDUCTOTHERM

Circle 694 on Page 55

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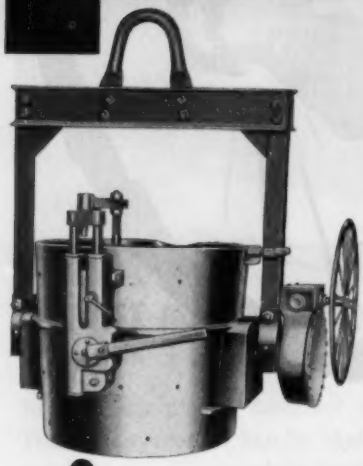

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Non-Ferrous Founders Hold Annual Meeting Oct. 13-15

The Non-Ferrous Founders' Society will hold its annual meeting Oct. 13-15 at the Grove Park Inn, Asheville, N. C., and on Oct. 12, the Cast Bronze Bearing Institute, a product group of N-FFS for bearing producers, will hold its annual meeting at the inn.

N-FFS business sessions will include the following topics: "Nature, Properties, and Engineering Applications of Nonferrous Alloys," Dr. R. A. Flinn, N-FFS technical consultant, Ann Arbor, Mich.; Customer Service Panel, featuring views on customer relations; "Is Mechanization Practical for the Small Foundry?", a panel discussion; and "Business Analysis and Profit Evaluation," John E. Graf, treasurer, Mansfield Brass & Aluminum Corp., Mansfield, Ohio.

M. E. Nevins, N-FFS president, and president, Wisconsin Centrifugal Foundry Inc., Waukesha, Wis., will present his report at the annual business meeting. Luncheon speaker is David R. Fall, headmaster, Asheville School, Asheville, N. C., and principal speaker at the annual banquet is Joe Powell, author and lecturer, who will speak on "Caveman to Spaceman."

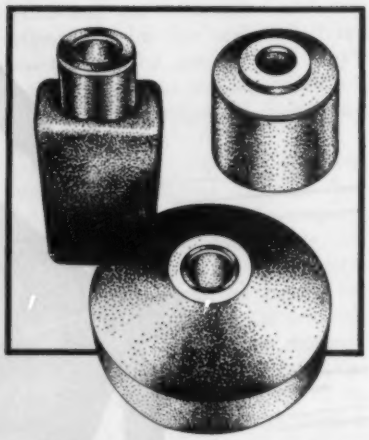
Programs are available from Herbert F. Scobie, executive secretary, Non-Ferrous Founders' Society, 1604 Chicago Ave., Evanston, Ill.

ASM Nominates Officers To Be Installed at Metal Congress

The American Society for Metals has nominated officers and trustees for 1960-61. Dr. William A. Pennington, currently serving as vice president of ASM, is nominee for president. He is professor of metallurgy at the University of Maryland, College Park, Md.

Dr. Carl E. Swartz, consultant in metallurgy and materials from Hinsdale, Ill., is the vice presidential nominee. Merrill A. Scheil, director of metallurgical research for A. O. Smith Corp., Milwaukee, is nominated for a two-year term as secretary.

Nominees for two-year terms as trustees are Dr. Morris Cohen, professor of physical metallurgy at Massachusetts Institute of Technol-



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ogy, Cambridge, Mass., and Dr. John Convey, director of the Mines Branch, Ottawa, Canada.

Under terms of the society's constitution, the secretary will cast a unanimous vote for the entire slate of nominees during the ASM annual meeting, a highlight of the 42nd National Metal Congress and Exposition, Oct. 17-21 in Philadelphia. They will take office at the conclusion of the National Metal Congress.

NYU Holds Annual Conference on Titanium Sept. 12-13

New York University's College of Engineering will hold its sixth annual conference on titanium metallurgy, Sept. 12 and 13, on the University Heights campus in the Bronx. The conference is intended for engineers from industrial research and governmental organizations.

The conference is sponsored by Crucible Steel Co. of America; E. I. Du Pont de Nemours & Co.; Harvey Aluminum Co.; Reactive Metals Inc., subsidiary of National Distillers & Chemical Corp.; Republic Steel Corp.; Titanium Metals Corp. of America, and Union Carbide Metals Co.

Aspects of titanium to be covered are heat treatment, alloying, fabrication technique, and low temperature properties.

Trustees Seek Expansion of Foundry Training Center

Trustees of England's National Foundry Training Center, West Bromwich, are conducting an industry-wide drive for £100,000 to refurbish and enlarge the center. Set up in 1949, the center operates on a co-operative basis and in ten years has trained 574 apprentices from 183 firms.

To meet the increased demand for foundry technicians, the trustees hope to increase the capacity of the center from 12 to 14 boys at any one time to twice that number. The expansion program will add improved equipment, a lecture room, lockers, and a shower. The center includes living quarters on the premises in addition to the training facilities.

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DEEP READING. Takes interior temperature deep within melt . . . tip can be immersed 3 inches or more in depth!

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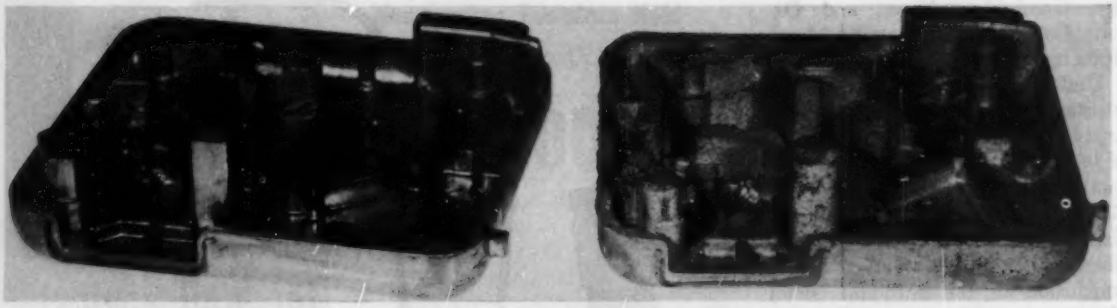


Left, aluminum framework used to simulate metal mold. Right, low-melting-point casting shows shrinkage and poor surface finish due to high pouring temperature

Methods of Demonstrating

CASTING TECHNIQUES

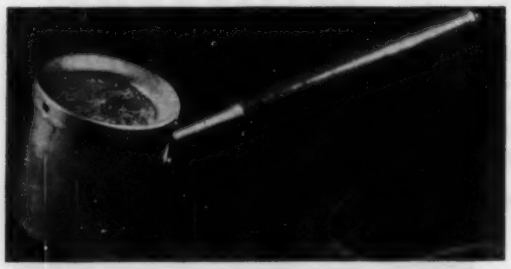
By J. B. McINTYRE
Senior Lecturer
National Foundry College
Wolverhampton, England

● Demonstration of melting and casting technique to students is a major problem in foundry educational practice.

Molding methods present little difficulty since standard equipment can be either scaled down in size or simulated in some way. Melting and pouring techniques are much more difficult to demonstrate, since to use any of the normal alloys of foundry interest requires large-scale melting furnaces. These facilities are not easily adaptable to classroom techniques; in some cases they may be too expensive. If castings production is to be demonstrated successfully, normal methods should be simulated as much as possible and on a scale which allows even large numbers of students to work individually.

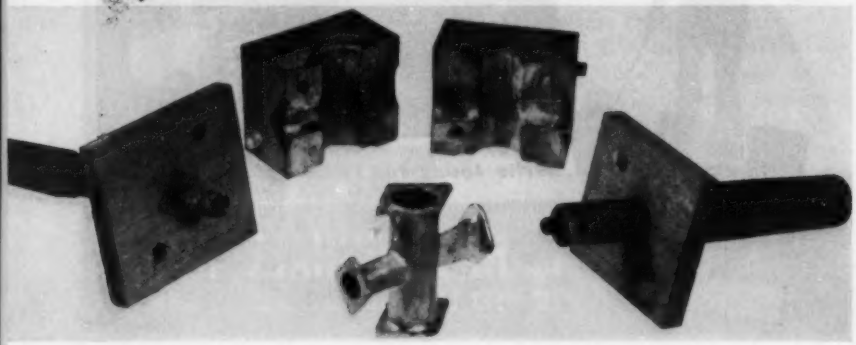
Some of the nonferrous alloys of foundry interest can be melted successfully in bench type injector furnaces. Usually gas fired, they are noisy in operation, particularly when several furnaces are working simultaneously. Groups of small-capacity electric melting units normally are not available, owing to high cost.

Each of the common alloys presents individual foundry problems due to high melting point, gas absorption, high or low specific gravi-

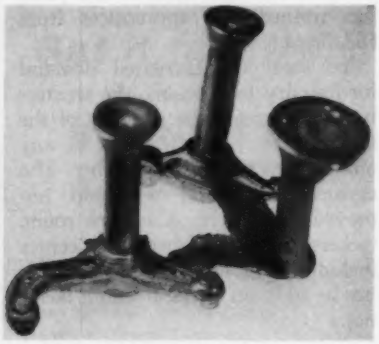


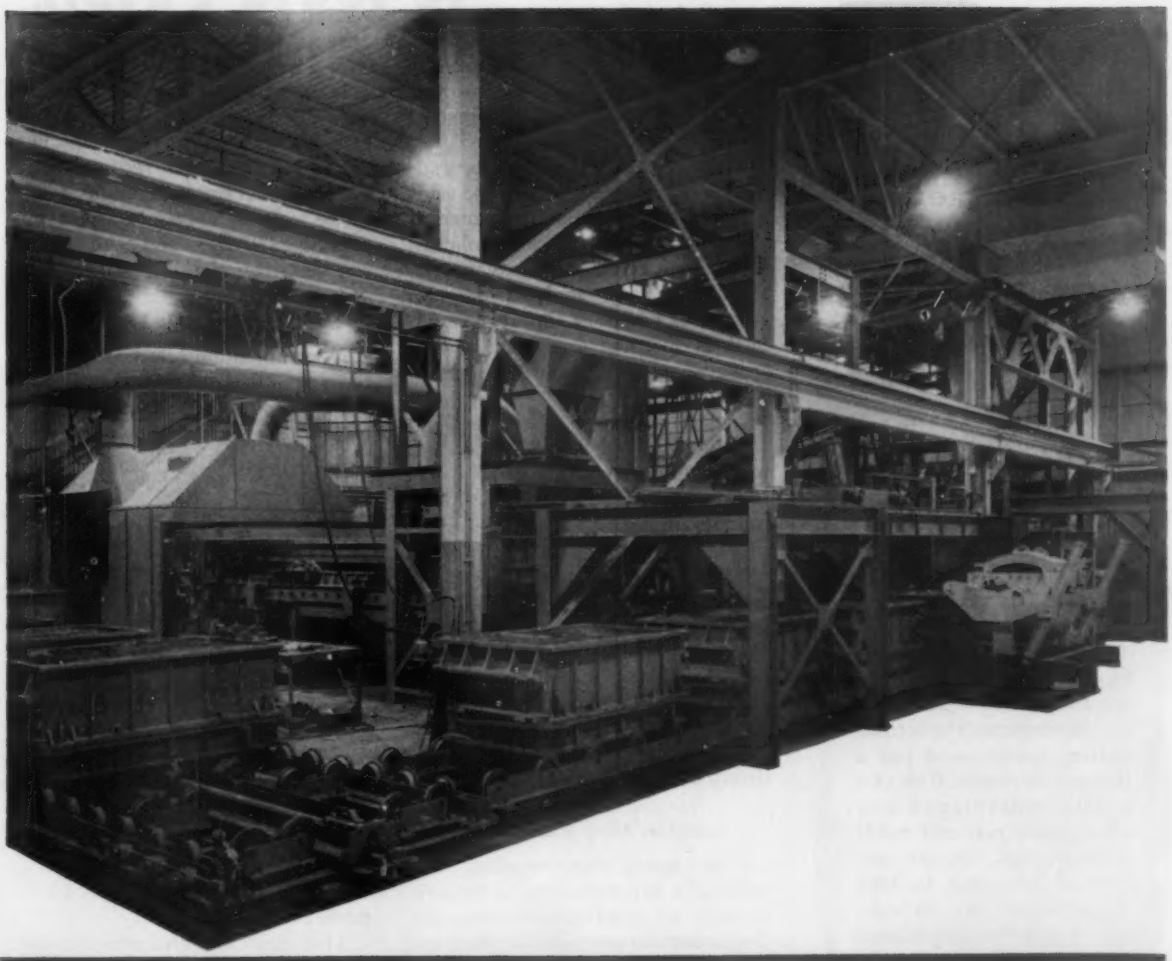
Bench type furnace illustrated can be used successfully to melt alloys which have low melting points

Wood permanent mold has been substituted for the cast iron permanent molds normally used. Casting shown was made in the mold



The green sand castings shown here illustrate increased dross formation on upper surfaces





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- First to use weights rather than clamps.
- First to incorporate automatic sand metering.
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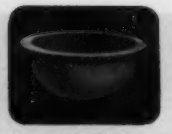

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Circle 700 on Page 55

ty, and dross formation. Since all common alloys cannot be used with convenience, a single alloy should be chosen which will indicate the maximum number of characteristics typical of the whole range.

The old practice of melting and casting paraffin wax and stearic acid mixtures is useful, but the material is not metallic and the long solidification time can be a disadvantage. Most important, students do not gain the necessary impression of castings manufacture when waxes are used as a substitute for metals and alloys.

Metallic material of low melting point, such as the fusible alloys, has high specific gravity. It demonstrates defects caused by hard or soft ramming in mold production, but these alloys are expensive since they contain bismuth, and they tend to show little shrinkage when changing from the liquid to the solid state. Students cannot be expected to appreciate the importance of gates, runners, risers, chills, and various casting designs if the alloy melted for experimental work does not shrink during solidification.

Suitable Alloy Established

After much experimenting, the value of a suitable alloy—a ternary eutectic of tin-lead-cadmium—for demonstration purposes has been established. This material (51.2 per cent tin, 30.6 per cent lead, 18.2 per cent cadmium) has a melting point of 288° F. It has great fluidity, combined with a slight dross forming capacity. Also, it is the cheapest of the low-melting-point alloys and is quite stable. Repeated remelting causes no difficulty provided there is no gross overheating. When this alloy is solid, a degree of shrinkage is displayed comparable with the majority of foundry alloys.

The low melting point of the alloy allows unorthodox mold material to be used if necessary, but castings may readily be made in all of the usual mold materials. The examples shown here are typical of the wide range of designs which can be produced. Green sand molds and plaster molds have been used extensively, and some use has been made of wood as a substitute for the cast iron normally used for permanent molds.

Centrifugal casting methods, both vertical and horizontal axis, can be demonstrated readily with ordinary heat-resistant glassware mounted in a lathe or on a metallurgical polishing wheel. The alloy can be melted over a bunsen burner, but this method is not recommended for students, since cadmium tends to be volatile at temperatures exceeding 1300° F—and the fumes can be unpleasant.

Combination Unit Developed

A combination electric melting furnace and ladle of simple design has been developed to permit molten alloy to be continuously available during the laboratory period without any danger of overheating. The furnace essentially is a shell and liner consisting of 16-gage spun aluminum insulated by loosely packed vermiculite. Heating is provided by a disc-type, mica-insulated element rated at 350 watts. This is clamped between thin cast iron discs placed immediately below the liner. The electrical wiring passes through the handle, which is made of plastic-impregnated fiber, and connects to an ordinary 15-amp outlet. Melting is rapid and a full charge of 5 lb of alloy is melted completely in 20 minutes. The furnace design permits repairs to be made easily.

The alloy and the melting unit were developed originally for the demonstration of castings production, but it also appears that the technique can be extended to the production of small ingots for the study of the effects of general ingot design on solidification of the type which may be encountered in the production of steel.

When it is desired to demonstrate the effects of overheating, or pouring at excessively high temperatures, it is preferable to use alloys such as 60-40 aluminum-zinc or one of the standard leaded tin bronzes which have had 0.2 per cent phosphorus added to emphasize the difficulties.

The solidification of castings is not easily shown on an experimental basis, but one useful method uses a wax "alloy" instead of orthodox material.

A mixture containing 70 per cent paraffin wax and 30 per cent white stearic acid has a low melting point and favorable shrinkage capacity. The best type of mold arrangement is that which consists of a frame-

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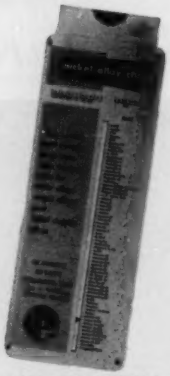

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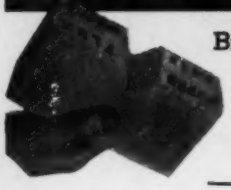

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work 3/8 in. thick shaped to the desired mold contour, and secured firmly between two glass plates at least 3/16 in. thick. The framework may be of aluminum to simulate a metal mold, or it may be plywood to give a slower cooling rate approaching that of sand.

In practice, the framework-glass assembly is supported vertically in laboratory clamps and is virtually a section through a mold of the chosen contour. The glass plates are preheated to 170° F to prevent premature chilling. All normal pouring methods can be tried, and impingement upon cores also can be shown. Chills and denseners can be applied to show the main characteristics of solidification.

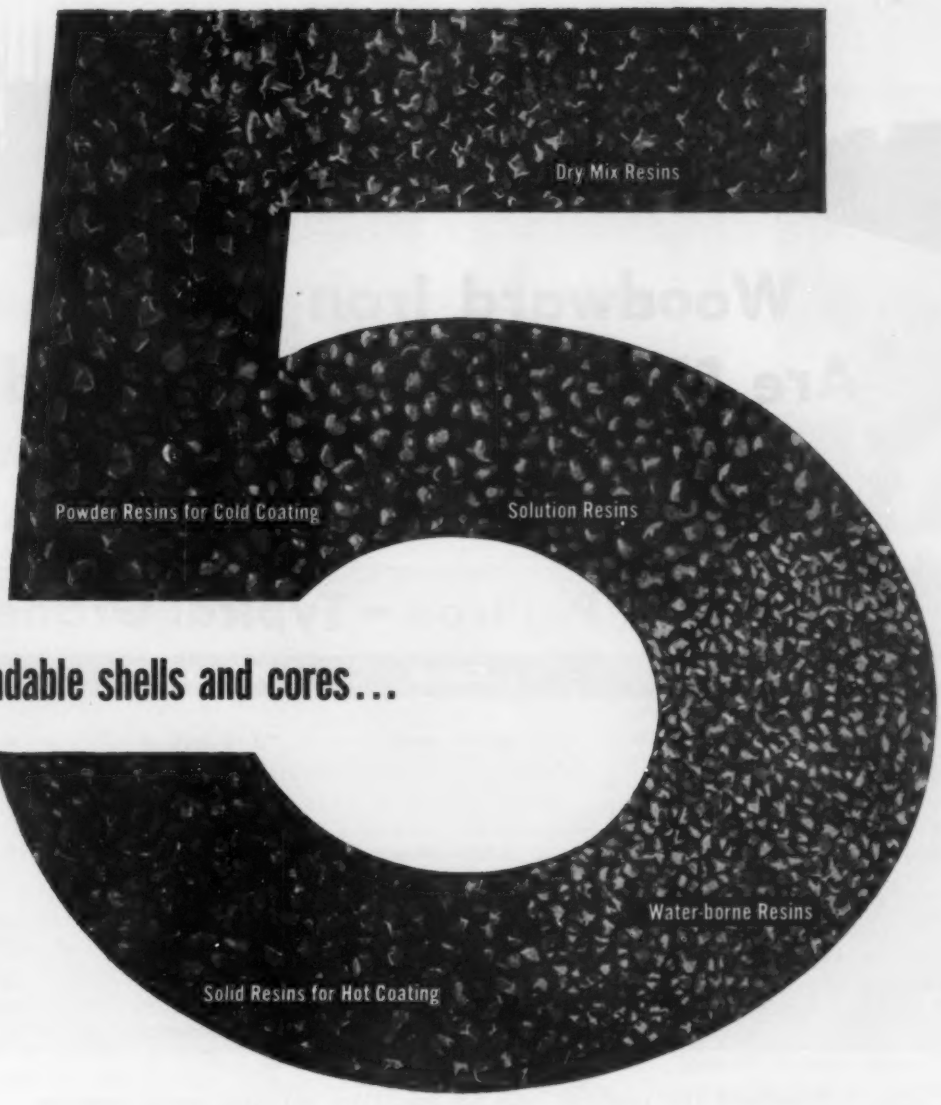
A valuable extension of this work is to pour the wax mixture into a small-scale mold, either sand or metal, as required. Enough wax is used to fill the casting cavity but not the risers. As the wax casting begins to solidify, red wax is poured into the risers and is drawn into the shrinkage areas. The time interval before feeding can be varied and each casting sectioned after solidification to show the effect.

Foundry Materials Handling Course Sponsored By MHEDA

The Material Handling Equipment Distributors Association is holding a special foundry materials handling course, Sept. 19-23, at the MHEDA National Training Center, Newport, R. I. The course will consist of lectures to be presented by ten foundry and materials handling specialists.

The lecturers are: Harry Kessler, Sorbo-Mat Process Engineers; William N. Ohlson, Draper Corp.; Peter J. Granieri Jr., industrial consultant; Michael R. Gallo, Taccone Corp.; L. W. Werner, Palmer-Bee Co.; Albert Musschoot, Carrier Conveyor Corp., a division of Chain Belt Co.; Robert P. Ferguson, Plainville Casting Co.; Frank Dzaman, Brown & Sharpe Mfg. Co.; James Sutherland, Link-Belt Co., and Dr. Merton C. Flemings, Massachusetts Institute of Technology.

Brochures describing the course are available from Harry Freeman, director, MHEDA National Training Center, 61 Narragansett Ave., Newport, R. I.



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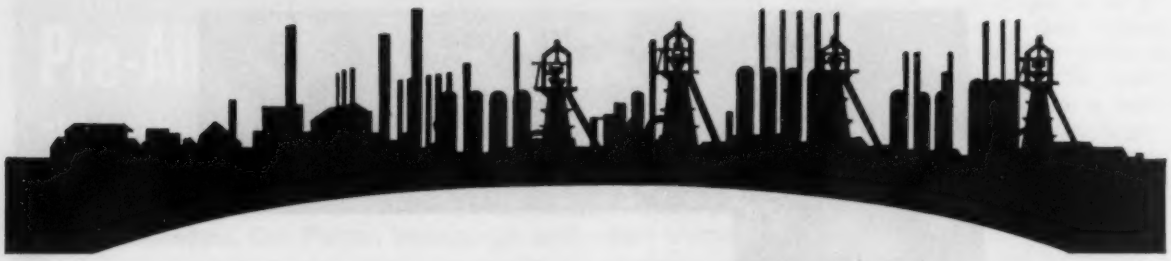

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Malleable	1.00 to 3.50% (as ordered)	0.05% Max.	0.10-0.30%	0.20-2.00% (as ordered)
Foundry	1.00 to 3.50% (as ordered)	0.05% Max.	0.301-0.70% (as ordered)	0.20-1.50% (as ordered)
Foundry (High Phos.)	0.75 to 3.50% (as ordered)	0.05% Max.	0.70-0.90% Up to 1.50% (as ordered)	0.20-1.50% (as ordered)

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. . . U. S. Pipe & Foundry executives

CLAUDE S. LAWSON

PATRICK W. ZILLIACUS

. . . becomes general sales mgr.

RALPH R. BEALS

. . . Carondelet marketing staff

Robert E. Garrett has been elected president and chief executive officer, United States Pipe & Foundry Co., Birmingham. **Claude S. Lawson,** who has been president since 1952, continues as board chairman. Mr. Garrett was executive vice president for the last year.

Edward W. Beardsley has been appointed southern regional vice president of the Industrial Div., Corn Products Sales Co., New York, with headquarters in Atlanta. **Thomas A. Bruce** has succeeded Mr. Beardsley as assistant western regional manager for the division.

Bernard C. Lindstrom has joined Baird - Atomic Inc., Cambridge, Mass., as sales engineer for spectrochemical instruments.

William E. Brandt Jr., Barry L. Selack, and **John G. Weber** have been named process engineers in vibratory finishing applications, Pangborn Corp. Mr. Brandt has been assigned to the Hagerstown home office, Mr. Selack to Cleveland, and Mr. Weber to Milwaukee.

Raymond E. Hess has been made acting executive secretary, American Society for Testing Materials, Philadelphia, continuing as technical secretary and editor-in-chief. **Robert J. Painter,** since 1952 executive secretary, will continue as treasurer and is to be consultant to the executive secretary. Mr. Hess has been in charge of ASTM headquarters during Mr. Painter's illness in the last year.

Patrick W. Zilliacus, formerly manager of agency sales, Western Precipitation Div., Joy Mfg. Co., Los Angeles, has been named general sales manager. He joined the company in 1956.

Maurice J. Lippincott has been named general superintendent, Florence Pipe Foundry & Machine Co., Florence, N. J. He is a director of the Philadelphia Chapter of the American Foundrymen's Society.

Vincent C. Faulkner, for nearly 40 years editor of *Foundry Trade Journal,* published in England, has become editorial director. He is an honorary member, past president, and medalist of the Institute of British Foundrymen. He helped to form the International Committee of Foundry Technical Associations, of which he was president in 1948, and has been active in other foundry organizations. Mr. Faulkner is succeeded as editor by **A. R. Parkes.** For the last 13 years Mr. Parkes was assistant editor. He has an extensive background of foundry experience, particularly in metallurgy.

Ralph R. Beals has joined the sales and marketing staff, Carondelet Foundry Co., St. Louis. He has been with the company for 25 years, chiefly in the production department.

Bruce A. Crocco has been appointed sales engineer for Danko Pattern & Mfg. Co. and Arlington Bronze & Aluminum Corp., Baltimore, in the Baltimore-Washington area. He was with American Brake Shoe Co., New York.

John C. Douglas, since 1957 vice president-technology, has been appointed vice president of operations, Union Carbide Metals Co., Union Carbide Corp., New York. **David Swan,** who has been manager of planning for the last year, has been made vice president of technology.

Roy D. Wilson, since 1958 sales engineer, has been named general manager, F. J. Stokes Co. of Canada Ltd., Toronto, Ont., subsidiary of F. J. Stokes Corp., Philadelphia.

James W. Green Jr., formerly assistant to the vice president, American Brake Shoe Co., New York, has been named managing director of the Wilmington, Del., plant, Eastern Malleable Iron Co., Naugatuck, Conn., succeeding **William H. Cantwell,** who held the position

ROBERT L. REED

. . . UCM general sales mgr.

WILLIAM J. STOCK

LEE S. ROBERTSON

PAUL R. De SANTIS

. . . promotions at Shenango Furnace Co.

eight years. Mr. Cantwell became vice president in February and will be in charge of new products and business for all company divisions.

Robert L. Reed, since 1957 Pittsburgh regional manager, Union Carbide Metals Div., Union Carbide Corp., has been named general sales manager, with headquarters in the New York home office. He joined UCM in 1946.

Victor L. Persbacker, comptroller, American Brake Shoe Co., New York, has been elected treasurer of the Controllers Institute of America. He has been active in the Institute since 1945, and has served as assistant treasurer since 1957.

F. Russell Stone recently joined North American Refractories Ltd., Hamilton, Ont., as sales representative with headquarters in Montreal, Que. He was formerly with Canada Fire Brick Co.

William J. Stock has been named assistant general superintendent, Shenango Furnace Co., Sharpsville, Pa. **Paul R. De Santis** has succeeded Mr. Stock as foundry superintendent, and **Lee S. Robertson,** general foreman, has assumed Mr. De Santis' former duties as assistant foundry superintendent.

William T. McGinnis, since 1956 vice president, has been appointed executive vice president, Keokuk Electro-Metals Co., Div. of Vanadium Corp. of America, New York. He joined the company in 1951.

Anthony A. Belusko, sand technician, Electric Steel Foundry Co., Portland, Oreg., has been elected chairman of the Oregon Chapter of the American Foundrymen's Society for 1960-61.

Donald C. Behner has been appointed Cleveland district sales manager, North American Refractories Co., Cleveland. He has been associated with the company since 1948.

Fred P. Hauck has been elected executive vice president, and **Robert C. Dickey,** vice president in charge of manufacturing, Michigan Abrasive Co., Detroit. Mr. Dickey continues as vice president and general manager, Coated Abrasives Inc., Detroit.

Edward C. Kells has been appointed manager, New York Metropolitan Industrial Sales, Corn Products Div., Corn Products Sales Co., New York, and **Joseph A. Donohue** has been named staff assistant. Mr. Kells succeeds **George W. Matthews Jr.,** who will continue with the company in an advisory capacity.

Richard J. Dvorak, formerly research metallurgical engineer in charge of foundry operations, Chrys-

F. RUSSELL STONE

. . . refractories sales, Montreal

ANTHONY A. BELUSKO

. . . Oregon Chapter chairman

DONALD C. BEHNER

. . . district sales mgr.

RICHARD J. DVORAK

. . . WaiMet Alloy Co. sales

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GORDON PATTERSON

. . . pres., Yale & Towne

HENRY ELLAS

. . . Electric Steel Foundry Co. sales

LAWRENCE GILLEN

ROBERT L. JOHNSON

. . . becomes foundry mgr.

ler Corp., Detroit, has been appointed sales engineer, WaiMet Alloy Co., Dearborn, Mich.

Gordon Patterson has been elected president, Yale & Towne Mfg. Co., New York, succeeding **Gilbert W. Chapman,** who has retired after serving as president 11 years. Former president of Square D Co., Detroit, Mr. Patterson continues as one of its directors.

Edward E. Hucke, associate professor of metallurgical engineering, University of Michigan, Ann Arbor, Mich., has been presented the 1960 Outstanding Young Engineer award by the Engineering Society of Detroit. The award, made annually to an engineer under 30 years of age, is based on recommendations and record of achievement.

H. J. Pfeifer, since 1956 San Francisco district manager, Union Carbide Metals Co., Div. of Union Carbide Corp., New York, has been appointed manager of the Phillipsburg, N. J., district.

Lawrence Gillen has been appointed sales manager of foundry products, Electric Steel Foundry Co., Portland, Oreg. He was field engineer for the Portland district. **Henry Ellas** will continue as manager of mill products sales, supervising stainless steel and plastic materials sales.

Donald M. Conroy has been appointed northern Ohio sales representative, Acheson Colloids Co., Port Huron, Mich., with headquarters in Cleveland. He was with E. I. du Pont de Nemours & Co., Wilmington, Del.

Townsend L. Way Jr., since 1958 Washington branch manager, Richards-Wilcox Mfg. Co., Aurora, Ill., has been named assistant sales manager. He joined the company in 1953.

Robert L. Johnson has been made foundry manager, Hardinge Mfg. Co., York, Pa. Before he joined the company in April he was general foreman of the iron foundry, Bucyrus-Erie Co., Erie, Pa.

James F. Connaughton, president, Wheelabrator Corp., Mishawaka, Ind., has also been named president and chief executive officer of Bell Intercontinental Corp., the parent company.

Donald P. Schroeder, for the last seven years associated with Hills-McCanna Co., Chicago, in various production, engineering, and sales capacities, has joined Foundries Specialties Mfg. Inc., Milwaukee, as a sales representative in the Chicago area.

Wesley H. Hauschildt has been appointed chief production engineer for aluminum operations, Foundry Dept., Dow Metal Products Co., di-

H. J. PFEIFER

. . . UCM district sales mgr.

DONALD M. CONROY

. . . joins Acheson Colloids Co.

TOWNSEND L. WAY JR.

. . . assistant sales mgr.

WESLEY H. HAUSCHILDT

. . . joins Dow Chemical Co.

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At Portsmouth, Ohio, in the modern foundry of the Ohio Stove Co., the SIMPLICITY 4′ x 6′ shakeout and the 30″ x 17′ model VS-12 conveyor (shown here at work) are helping speed operations and reduce unit production costs. First, snap molds are floor dumped; then both castings and sand are scooped and loaded onto the SIMPLICITY shakeout. The castings are then carried on the SIMPLICITY conveyor to the waiting tote boxes. The many plants that are using SIMPLICITY shakeouts are indicative of their foundry-proved superiority. Get complete facts on SIMPLICITY shakeouts, feeders, and conveyors. Write us today.

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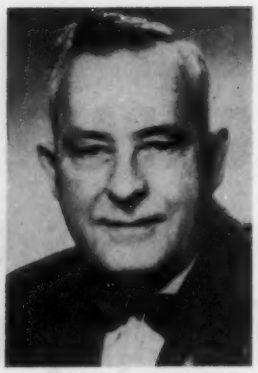
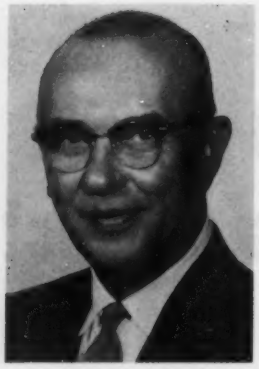
A. T. LLOYD
. . . Brumley-Donald sales



CHARLES F. SAFREED



HERBERT T. FLORENCE
. . . Cleveland Crane executives

ROBERT A. NYQUIST
. . . joins F. B. Stevens

vision of Dow Chemical Co., Bay City, Mich. He formerly was with American Brake Shoe Co., Mahwah, N. J.

A. T. Lloyd has been appointed assistant manager of sales, Los Angeles Foundry Div., Brumley-Donaldson Co., Huntington Park, Calif.

Irving Whitehouse has been named director of research, Republic Steel Corp., Cleveland. Former assistant director of research, he succeeds the late Earle C. Smith.

Wilgus Combs Jr., with Kaiser Refractories & Chemical Co., has been elected chairman of the Toledo Chapter of the American Foundrymen's Society for 1960-61.

Taylor S. Iams has joined Macklin Co., Jackson, Mich., as Pittsburgh sales engineer. He is a director and board chairman of Unifab Co., Kalamazoo, Mich.

Herbert T. Florence has been elected president and general manager, Cleveland Crane & Engineering Co., Wickliffe, Ohio, succeeding **Charles F. Safreed**, who has become board chairman. **William J. Ryan** has been made vice president-assistant general manager. **Ralph Ford**, plant superintendent, has also been named assistant secretary.

Thomas J. Bennett has been appointed general sales manager, Master Power Corp., Bedford, Ohio. **Edgar D. McIntosh** succeeds Mr. Bennett as central district manager with headquarters in Cleveland.

Dr. Harold W. Ruf, who has been director of the Research and Development Div., Grede Foundries Inc., Milwaukee, has been elected a vice president.

J. Robert Von Bargen has been appointed assistant eastern regional manager, Corn Products Div., Corn Products Sales Co., New York. In company industrial sales since 1945, **Cleo Mikel** has succeeded Mr. Von Bargen as Buffalo district manager.

Robert A. Nyquist has been appointed western Michigan sales engineer, Finishing Div., Frederic B. Stevens Inc., Detroit, with headquarters in Grand Rapids. He was with Bay City Div., Electric Auto-Lite Co.

Wallace Macgregor has been named president of Climax Molybdenum Co., New York, succeeding **Frank Coolbaugh**. Mr. Macgregor has also been made vice president of American Metal Climax Inc., New York, the parent company. Mr. Coolbaugh is president of the latter.

John Zotos, formerly assistant chief of Rodman Laboratory Experimental Foundry Branch, Watertown Arsenal, Watertown, Mass., has

TAYLOR S. IAMS
. . . joins Macklin Co.

CLEO MIKEL

J. ROBERT Von BARGEN
. . . Corn Products Div. appointments

JOHN ZOTOS
. . . accepts teaching post

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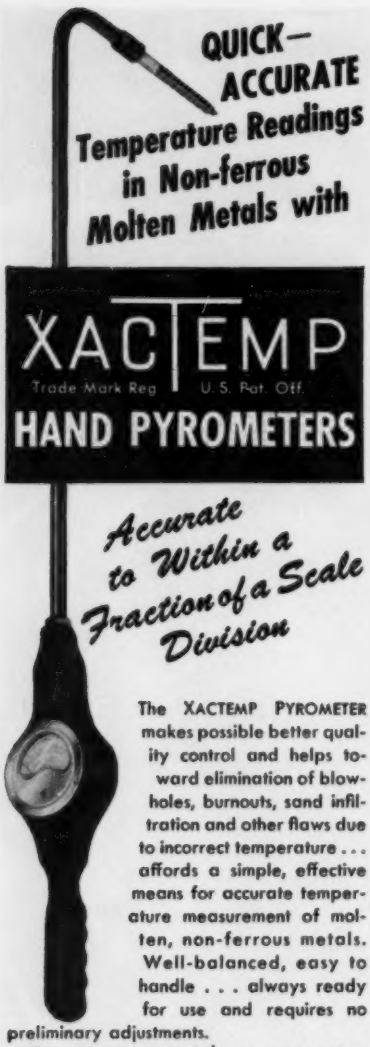
Circle 708 on Page 55



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Circle 709 on Page 55

ALLEN B. HUGHES
. . . Bay State district mgr.

RICHARD A. YEOMAN
. . . Joy Mfg. district mgr.

been named assistant professor in the Department of Mechanical Engineering, Northeastern University.

Allen B. Hughes has been appointed West Coast district manager, Bay State Abrasive Products Co., Westboro, Mass. Recently he has been company abrasive specialist in Pennsylvania and New Jersey.

Charles P. Egolf has been named assistant manager of the southeastern sales office, Diamond Alkali Co., Cleveland, with headquarters in Memphis, Tenn.

J. S. Bowater, secretary, Mathews Conveyer Co., Ellwood City, Pa., has been elected vice president and secretary and **C. F. Kincaid**, treasurer, has been made vice president and treasurer.

Richard G. Caulton has been named eastern sales manager, Apex Smelting Co., Chicago, with headquarters in Cleveland. **Donald L. Colwell**, vice president in charge of laboratories, who was Cleveland sales manager for the last two years, will devote full time to research and development.

George Duncan has been appointed southeastern representative for clamshell bucket sales, Erie Strayer Co., Erie, Pa., with headquarters in Atlanta.

Paul Barry, formerly with Theim Products Inc., Milwaukee, has joined G. E. Smith Inc., as eastern sales representative with headquarters in the Pittsburgh home office.

Richard A. Yeoman, manager of oil field compressor sales, has been transferred to Cleveland as district manager for Joy Mfg. Co., Pittsburgh. He was in Dallas.

Boyd Cass has been appointed general manager, Metals Refractories Group, Howe Sound Co., New York. He will co-ordinate the operations of the group, including development of new products and expansion of present product lines.

Charles S. Stock has been named manager of central marketing, American Air Filter Co., Louisville, Ky. **A. B. Ullrich Jr.** has been made manager of the engineered air systems division.

James J. Nork has been transferred from the San Francisco office, Fuller Co., Catasauqua, Pa., to the Los Angeles office, as sales-service engineer. The latter was recently moved to the company's plant in Compton, Calif.

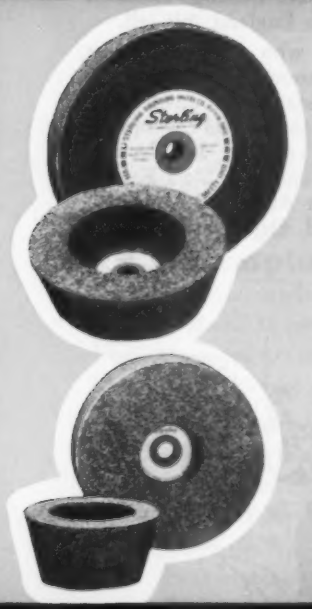
George P. Stearns has joined Euclid Crane & Hoist Co., Cleveland, as representative in southern California, Arizona, and part of Nevada, with headquarters in Long Beach, Calif.

Robert B. Norris has joined the Cleco Div., Reed Roller Bit Co., Houston, as field sales engineer in the Philadelphia area.

Leonard J. Lindstrom has been named manager of engineering and research, Despatch Oven Co., Minneapolis. He has been chief electrical engineer since 1956.

Circle 710 on Page 55→

Portable Grinding Problems Disappear When *Sterling* is on the job!



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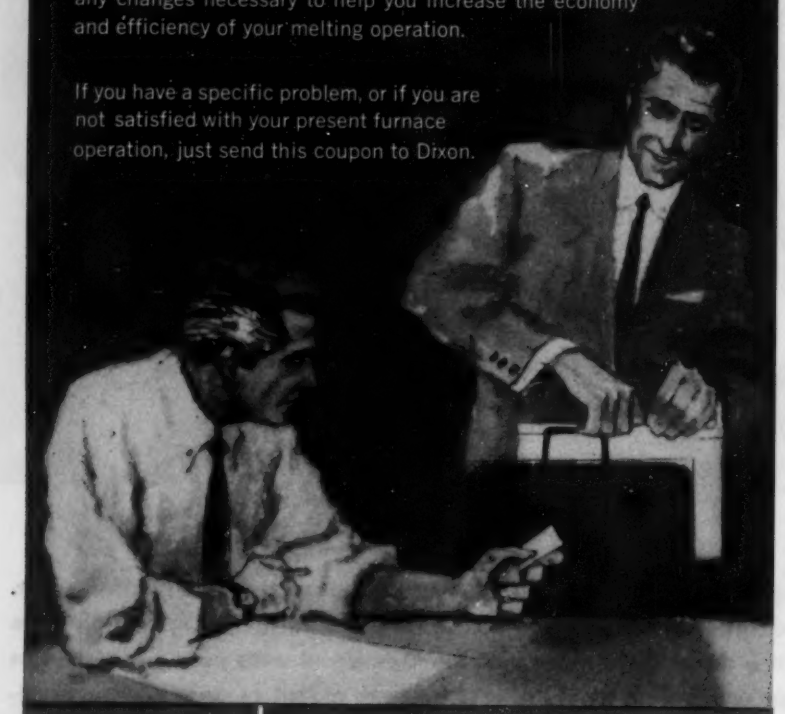

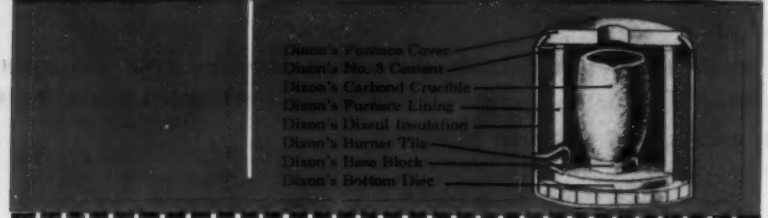

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Gray Iron Founders Receive Award from Safety Council

Gray Iron Founders' Society has been named a winner of the National Safety Council's Association Award for 1960. It was one of 10 associations, representing various industries in the United States and Canada, cited by the Council for excellence and balance in their safety programs and above-average progress in accident prevention.

The society reduced its disabling injury frequency 19 per cent from 1954-58 and 8.7 per cent last year. It was cited for a continuing program of surveying members, safety activities and insurance rates, for collecting and analyzing accident statistics, and for providing materials and consultation to association members.

Exchange Lecturer Is Selected By Steel Founders' Society

Steel Founders' Society of America has selected Clyde B. Jenni, director of research and chief metallurgist at the Eddystone, Pa., plant of General Steel Castings Corp. to deliver the SFSA exchange lecture before the British Steel Castings Research Association in England this fall.

Mr. Jenni, who earlier this year received the society's Technical and Operating medal for his outstanding contributions to the steel castings industry, will deliver his lecture, "Technical Control in Steel Foundries in North America," in Harrogate, England, Oct. 20.

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- **How can casting feeding be improved?**
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Written to simplify and solve the problems of practical foundrymen, this book is the only up-to-date, comprehensive work available on production of brass and bronze castings. The author has a background of many years of experience, most recently as superintendent in charge of the brass foundry at Crane Co. In 1947, he was awarded the William H. McFadden Gold Medal for his many outstanding contributions to the society and the industry. Order your copy today.

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11. Green Sand Molding Practice
12. Other Molding Methods
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Obituary

Clifford B. Cornell, 68, secretary-treasurer, Cleveland Flux Co., Cleveland, died Aug. 3 from injuries incurred in an automobile accident on July 21. A native of Canton, Ohio, Mr. Cornell joined the company in 1918 when it was formed by his

father. He was a director of Clyde Cutlery Co., Clyde, Ohio; Morgan Engineering Co., Alliance, Ohio; and Prestole Corp., Toledo, Ohio.

Isadore Glueck, 79, for the past 13 years secretary of the Brass and Bronze Ingot Institute, Chicago, died there July 13. He was with Federated Metals Div., American Smelting & Refining Co., from 1915 until retirement in 1946, and served as Chicago plant manager, sales and export manager in New York, and general manager of the eastern division in New York.

William F. Goetz, 61, for 25 years chief production engineer, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, died Aug. 1.

Stanley J. Kuras, 53, for the last 15 years general foreman, International Harvester Co., Milwaukee, died Aug. 4. He joined the company in 1928.

D. C. Snow, former secretary-treasurer, International Molding Machine Co., LaGrange Park, Ill., died May 23. Miss Snow, widely known in the foundry field during her active years, served the Pridmore family, founders of International, for 50 years. She retired Dec. 4, 1943, and lived in Haddon Heights, N. J.

Henry F. Wardwell, 83, founder and president, Burnside Steel Foundry Co., Chicago, died Aug. 1, following a long illness. Mr. Wardwell for many years was an active member of the Steel Founders' Society of America.

New England Chapter, AFS Elects 1960-51 Officers

New England Chapter of American Foundrymen's Society has elected new officers for 1960-61. P. C. Smith, General Electric Co., is the new president. Other officers are L. W. Greenslade, Brown & Sharpe Mfg. Co., first vice president; Harry K. Sleicher, Seaboard Foundry Inc., second vice president; Dan J. Pendergast, Daniel J. Pendergast Foundry Supplies, secretary; and T. I. Curtin Jr., Waltham Foundry Inc., treasurer.

Members of the executive committee are E. Frank Tibbetts, Wollaston Brass & Aluminum Co.; Paul T. Mongeau, Joy Mfg. Co.; Gerrit H. Ebbeling, Whitin Machine Works; William C. Naughton, Whitehead Bros. Co.; Longin Shore, Reid Foundry Inc.; Nicholas Nesbit, Grinnell Corp.; John F. Dwyer, Shell Process Inc.; Ahti Erkkinen, Fremont Casting Co.; and Charles A. Reed.

Mr. Naughton and Mr. Pendergast are chairman and assistant chairman, respectively, of the membership committee. Mr. Greenslade is program chairman, and John H. Orrok, Debevoise-Anderson Co., is publicity chairman.

Book Review

Data Sheets on Dust Collectors, Second Edition, paper cover, 35 pages, 8 x 10 in., published by the British Steel Castings Research Association, East Bank Road, Sheffield 2, England. Price 30s.

Data sheets included in this book contain details of 32 dust collectors made by 19 companies. Collection efficiency, pressure drop, and water usage of each type are indicated. A diagram, showing the principle of operation, is given in each case.

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Circle 714 on Page 55

How To Buy Hoppers

● THE self-dumping hopper is one of the simplest tools used in material handling, but it can be inefficient if it does not fulfill certain requirements.

Roura Iron Works Inc., Detroit, lists hopper capacity, type of mounting, type of dumping action, and hopper design as the important factors to be considered. All aspects of each factor must be considered before the proper hopper can be selected.

Size — In determining the size hopper required, the type of material handled is not as critical as the handling cycle. If hoppers are emptied frequently, even though they're not full, a smaller, lighter model would be best. If hoppers are emptied only when full, then larger sizes will reduce the number of handlings.

When fork trucks and hand trucks are used to move hoppers, the capacity of the truck must be considered. The combined weight of a big hopper and its contents can exceed the truck's load limit. As a guide, here are the approximate weights of standard size hoppers:

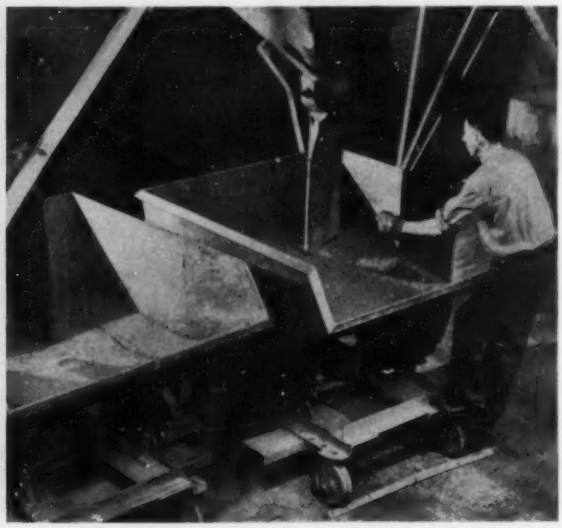
Hopper Capacity (cubic yards)	Approx. Empty Weight (lbs)
½	500
¾	625
1	660
1½	825
2	900

Casters or Skids—If it would be advantageous to have hoppers that can be moved manually or towed

Minor modifications will permit tiering hoppers three or four high to fit requirements. Hoppers shown here are being stacked to await dumping

Lock handle on hopper with balanced dumping is released to permit hopper to tilt forward to dump. When hopper returns, handle locks automatically

Hoppers mounted on these malleable iron casters can be pushed manually or pulled by tractor. Rubber tire or plastic casters also are available



by a tractor, specify caster mounting. Hoppers with malleable iron casters last much longer than ordinary casters under rough use. For special applications rubber tire casters or even plastic casters can be obtained. If casters are not required, skid-type mounting will save money.

Fork Entry—Standard hoppers are mounted for handling by either platform-type lift trucks or fork-type lift trucks. If both will be

Hopper illustrated is mounted for handling by fork-type lift truck. Combination mountings permit entry by either fork-type or platform-type trucks

used, specify a combination mounting which permits entry by either type.

Although most hoppers are lifted and carried from the rear, a special three-way entry skid-mounting can be obtained which allows pickup from the rear or either side. Side entry is advantageous when hoppers are stationed in crowded locations.

Dumping Action—Two types of dumping action can be specified—balanced or controlled.

A balanced hopper is the only really self-dumping hopper. It is so constructed that when a lock-handle on the rear is released, it tilts forward to dump, returns to an upright position, and locks automatically. Balanced hoppers are the most common in use, and are correct for most bulk-handling operations.

If slow or controlled dumping is required, the hopper's lock-handle is replaced with a pulley-and-winch arrangement which permits the hopper to be tilted or returned at will. Controlled dumping is practical when, for example, the hopper is handling liquids, when the hopper's contents are being dumped onto a moving conveyor, or when the hopper is not to be emptied completely.

Storage—If storage space is at a premium, order hoppers equipped with special flanges which permit hoppers to be stacked on top of each other. Loaded hoppers can be tiered if the contents are level. Use of self-dumping hoppers for storage of bulk materials is particularly practical because the hopper's contents can be emptied in a few seconds.

Specials — Standard hoppers are made of heavy steel plate to withstand the abuse of heavy loads and rough handling. But this construction can and should be modified if an operation requires it. For handling abrasive materials, manganese steel bottoms will protect hoppers from excessive wear. Zinc-coated hoppers are best suited for handling chemicals and similar materials which must be kept pure. Stainless steel construction often is specified if hoppers are to be used for acid products or if they must be cleaned frequently.

Extra-heavy steel reinforcements are welded to hoppers to prevent warping when they are used for hot materials. For instance, hoppers used to handle slag in foundries usually are reinforced and often are specially constructed with tapered sides to prevent "freezing". On the other hand, for installations where weight is a factor, hoppers can be made of aluminum.

Although the standard sizes in which hoppers are available are adequate for most operations, special sizes can be obtained.

Scrap Institute Issues Annual

The Institute of Scrap Iron & Steel Inc. has released its 1960 Yearbook. The book contains an analysis of scrap sales and the current market, scrap yard processing procedures, the sources of scrap, scrap exports, and a study of scrap prices. Charts and tables give 1959 and previous years' consumption figures. The specifications for iron and steel scrap also are included.

Copies of the publication are available from the institute at 1729 H St. N.W., Washington 6, D. C.

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Circle 716 on Page 55

THE METALLURGY OF STEEL CASTINGS

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The Shakeout

Aluminum Rocker Arm Is New for Auto Engines

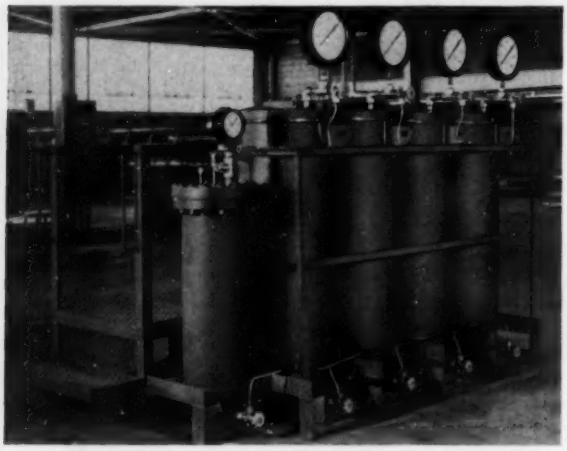
LATEST application of aluminum in automobile engines is the rocker arm. The development is the result of a four-year program by Aluminum Co. of America. Big advantage claimed for the aluminum components is lighter weight and, thus, lower inertia. Alcoa feels that in a part which has to change direction as many as 20 times per second, this advantage should result in less wearing of the valve-lifting mechanism.

The rocker arms shown here are diecast, but they can be made by other methods. Extensive testing has been carried out by Alcoa, which fitted the components to an engine driving the generator of a dynamometer. Various tests were used, some of which were designed to produce a year's wear in less than one week. Two major automakers are reported to have adopted the aluminum arms.

For More Details Circle No. 517—Page 55

CO_2 Liquefier Units Withstand High Pressures

LIQUEFIER UNITS recently delivered to the U. S. Air Force by Nucledyne Div., Cook Electric Co., Chicago, withstand working pressures up to 12,000 psi, gas test pressure to 18,000 psi, and hydrostatic pressure to 3000



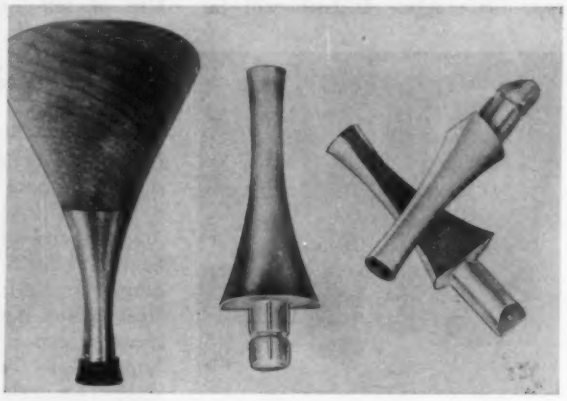
psi. These pressures are required to convert dry ice to liquid CO_2.

The unit shown here is a 600-lb capacity design which consists of four 150-lb capacity tanks. Loading covers use a self-sealing principle obtained through close-tolerance manufacturing, and pressure relief valves are provided as a safety measure.

For More Details Circle No. 518—Page 55

Diecast Heel Solves Crisis in Fashions

A CRISIS in ladies' fashions was resolved recently by Newton-New Haven Co., West Haven, Conn., with an aluminum diecasting. When high spike heels became stylish a few years ago, they originally were made of wood, but that material presented problems. Good

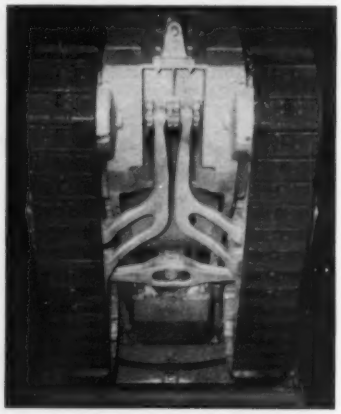


wood was difficult to acquire, expensive, and often did not stand up under service.

Newton-New Haven designers came up with a diecast aluminum heel which possessed the needed strength without sacrifice of design or style and also added a plus value. A hole running up the heel shaft, cast into the part simultaneously, provides space for the insertion of a wooden plug to which the leather lift can be fastened.

For More Details Circle No. 519—Page 55

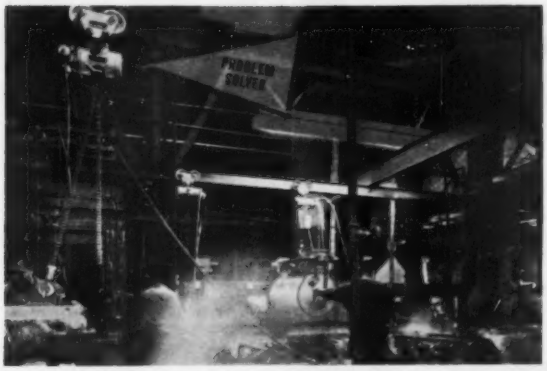
Many Large Steel Castings Used in Crawler



STEEL CASTINGS are used extensively in crawler tractors manufactured by Eimco Corp., Salt Lake City, Utah. Track roller frame and diagonal brace assemblies, main frames, twin final drive housings, and center housings are cast in steel. Each casting is designed so that there are no stress concentrations within the structural member. Instead, internal stresses and stresses due to applied loads "flow" evenly throughout the structure.

When the final design for a casting has been completed by the stress engineers, the drawings are turned over to the foundrymen.

For More Details Circle No. 520—Page 55



Budgit Air Hoists cut maintenance 75%

Specified Plating Company, Chicago, Ill., does all kinds of plating on order. It is a 16-hour day operation.

Budgit Air Hoists cut maintenance costs 75% over electric hoists. The high moisture atmosphere doesn't harm the Budgits, so the maintenance man can now attend to regular duties.

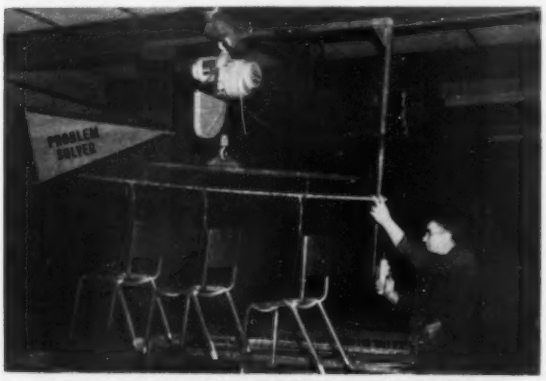
Operators of the Budgit Air Hoists say air is faster, the job is easier, and they keep ahead of the normal work cycle. With higher production speeds, operations are nearly automatic except for dipping.

Ask your Shaw-Box Distributor about Budgit Air Hoists in ¼, ½ and 1 ton capacities and Load Lifter Air Hoists, 1 to 15 tons. Write for Bulletin 15025-1C.

BUDGIT® AND LOAD LIFTER® AIR HOISTS
A product of
MANNING, MAXWELL & MOORE, INC.

Shaw-Box Crane & Hoist Division • Muskegon, Michigan
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario.

60 A0-3



99-hour week for Budgit® Electric Hoist

Star Machine Company, Spring Lake, Michigan, keeps this Budgit Push Button Electric Hoist on 18-hour service over plating tanks 5½ days a week. Metal stampings are dipped into 11 tanks by the hoist operator. Fast push-button action permits 12 "jogs" a minute — terrific abuse for any small electric hoist, regardless of the application.

Star Machine gets continuous plating service with a complete push-button hoist installation that cost no more than $500. To learn more about this fast, tough, two-brake P:B Budgit Electric Hoist, write for Bulletin 15010-15C — or ask your nearby Shaw-Box Distributor for a free demonstration.

60A-4

BUDGIT ELECTRIC HOISTS
A product of
MANNING, MAXWELL & MOORE, INC.

Shaw-Box Crane & Hoist Division • Muskegon, Michigan
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

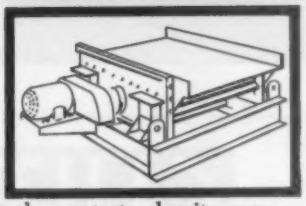
Circle 740 on Page 55

NON-FLUID OIL

TRADE MARK REGISTERED

Does Not Dry Out Like Ordinary Grease . . .

But Lubricates Indefinitely Until Consumed



In foundry shake-out and screen operations, NON-FLUID OIL never loses its lubricating properties. Specifically designed to "stay alive" longer in bearings, it efficiently protects despite age, heat and exposure.

NON-FLUID OIL will always remain free from acid . . . thus there is no danger of pitting and discoloration of ball and roller surface bearings. Because it is viscous and clinging, it forms a protective seal around the bearing ends, effectively barring the entrance of grit and sand. You will find, also, that NON-FLUID OIL lasts three times as long as other lubricants.

Proof of the lubricating efficiency of NON-FLUID OIL is that the majority of manufacturers of shake-outs and vibrating screens use and recommend it for insuring uninterrupted service and longer life of bearings. But convince yourself . . . send for a free testing sample and Bulletin 559.

NEW YORK & NEW JERSEY LUBRICANT COMPANY

292 Madison Ave., New York 17, N. Y.
WORKS: NEWARK, N. J.

WAREHOUSES

Birmingham, Ala.	Charlotte, N.C.	Springfield, Mass.	Providence, R.I.
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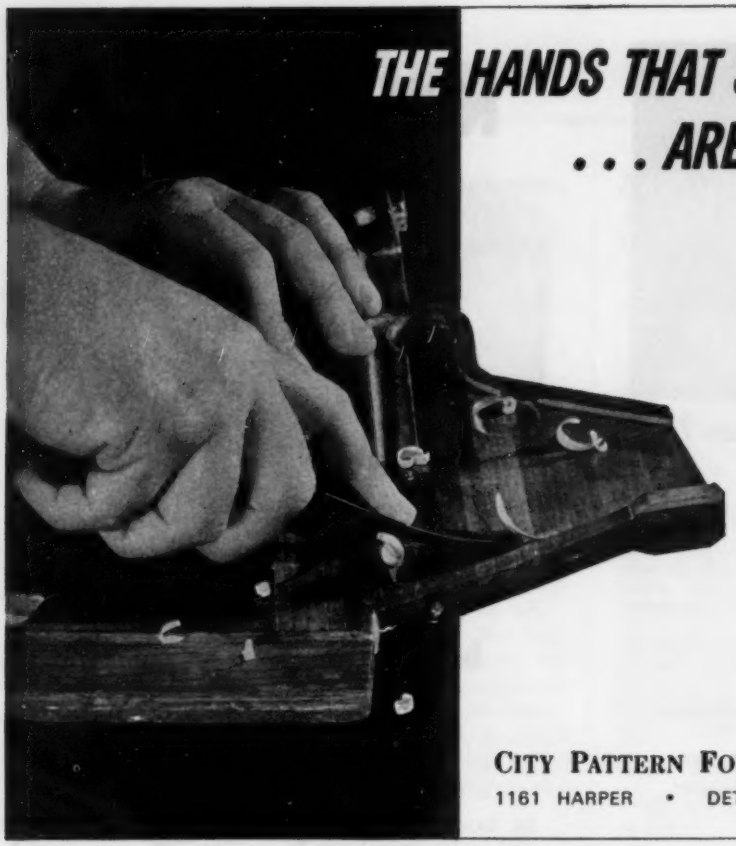
Columbus, Ga.	Chicago, Ill.	Detroit, Mich.	

Also represented in principal industrial centers, including Pittsburgh, Pa., Cleveland and Cincinnati, Ohio.

NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture. So-called grease imitations of NON-FLUID OIL often prove dangerous and costly to use.

Circle 741 on Page 55



THE HANDS THAT SHAPE TOMORROW . . . ARE HERE TODAY!

Here skilled hands carefully pilot your patterns through every operation performed on them . . . using the latest methods and finest equipment.

Unvarying high quality is maintained in both metal and wood patterns through careful layout and frequent inspections . . . and it is on such quality that City Pattern Foundry & Machine Co., Inc. has built its reputation.

CITY PATTERN FOUNDRY & MACHINE CO., INC.
1161 HARPER • DETROIT 11, MICHIGAN • TR 4-2000

Circle 718 on Page 55

GLUTRIN
LIQUID BINDER

GOULAC
DRY BINDER

For

CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

ROBESON PROCESS COMPANY
(Established 1905)
GENERAL OFFICES AND PLANT: • ERIE, PA.

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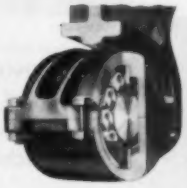
For dependable service, specify CHASE Industrial Wheels, Axles, Bearings and Brackets

High-strength gray iron wheels are available in a wide range of sizes and styles, including single and double flanged, flat face, and rubber, plastic or composition tired.

Wheels can be equipped with Chase flexible bearings or Timken, ball, bronze or other bearings of your choice. Axles and attaching brackets are available for all styles of wheels.

CHASE FLEXIBLE BEARING

Dust-proof and oil-retaining, this trouble-free bearing has kept cars and trucks rolling smoothly through thousands of plants in the U. S. for many years. Its simple but effective design keeps maintenance problems at a minimum.



Chase FOUNDRY & MANUFACTURING CO.

Send your specifications for a prompt price quotation or write for bulletin.

2900 Parsons Avenue, Columbus 7, Ohio

Circle 720 on Page 55

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Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

WRITE TODAY FOR NEW BULLETIN AND DIMENSION SHEET

No. 4-A
Self-Dumping

PENN IRON WORKS, INC.
READING, PENNA.

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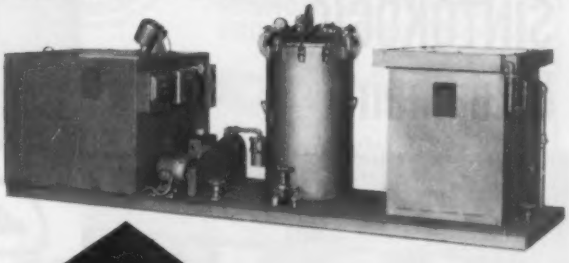
OUT OF YOUR COST PICTURE!



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MOGUL, because of extremely high vacuum, removes air and moisture for positive penetration of impregnant into parts. Following this vacuum action, applied pressure then assures still greater coverage and impregnation.

CHECK THESE MOGUL ADVANTAGES:

- **COMBINATION high vaccum and pressure**
- **VERSATILE sizes and ranges: 2 to 100 cu. ft. as standard models 29" or more vacuum, 100 lbs. pressure**
- **THERMOSTATIC CONTROLS**

PLUS:

READY-ASSEMBLED INSTALLATIONS that save work, time and cost

Just hook up complete packaged unit to your utilities and start operation!

ASK ABOUT MOGUL CUSTOM DESIGNING & BUILDING

Phone SAcramento 2-3710 — or write

METALLIZING COMPANY OF AMERICA, INC.
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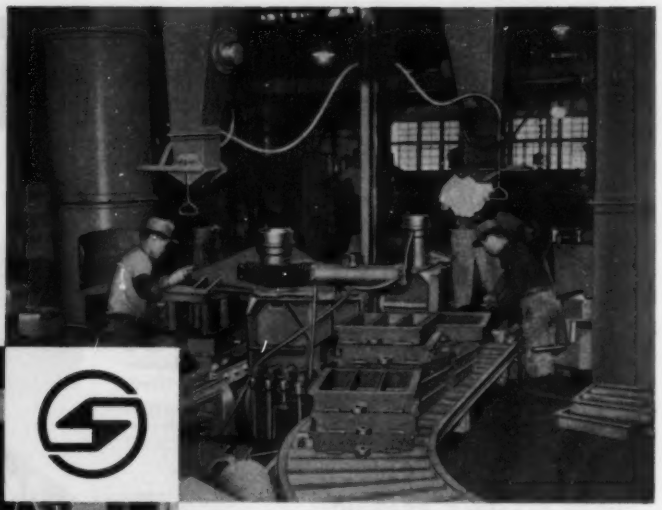
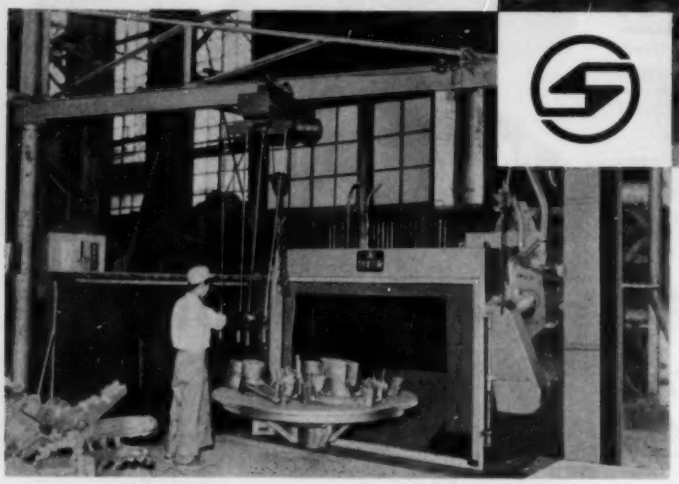
Circle 722 on Page 55

Progressive Foundries Specify SINTOKOGIO Equipment





Moulding Machines
Sand Preparing Machines
Shot Blasting Machines
Mechanized Foundry Equipment

Sintokogio, Ltd.

Showaku Nagoya Japan
Cable Address "SINTOKOGIO" NAGOYA

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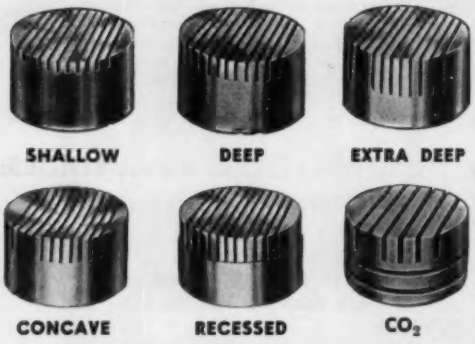

Slotted core box vents for every purpose. Inserting drill (right) ideal for inserting core vents. Special cleaning tool saves time.

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APPRAISALS . . . WAGE INCENTIVE PLANS . . . COST SYSTEMS . . . EXECUTIVE CONTROL . . METHODS PRODUCTION CONTROL SYSTEMS . . . PLANT REMODELING . . PLANT DESIGN . . CONTINUOUS SYSTEMS . . . SEMI-CONTINUOUS SYSTEMS . . . PRESENT OPERATION MODERNIZED

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Circle 725 on Page 55

EMPIRE*

"THAT GOOD" FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION
2201 First Ave., North • Birmingham 3, Ala.
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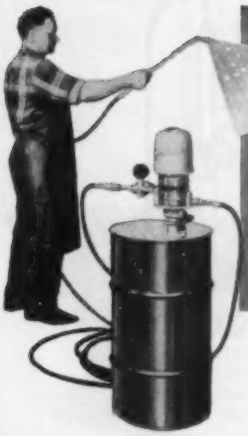

Best NEW bet for all INDUSTRIAL CLEANING— low-cost GRACO hydra-clean!

- *Simple . . . one man operation*
- *Flexible . . . fits any container from 15 to 55 gallons*
- *Durable . . . non-corrosive pump, fittings and connections*
- *Economical . . . air-powered pump*
- *High Pressure . . . either 2 to 1 or 5 to 1 ratio*
- *Complete Package . . . ready to operate in your container*

New, low-cost spray wash unit thoroughly cleans machinery, floors, walls, tanks, etc. Combines hydraulic pressure with GRACO "Dirt-Tergent" cleaner or other water soluble detergent . . . loosens and flushes away dirt, grit, grime and scale, *amazingly fast and easy*. Ideal for all general cleaning and preparing surfaces for painting. Get the Hydra-Clean story today!

FREE IDEA BOOK SHOWS GRACO PUMPS FOR EVERY NEED. SEND FOR IT TODAY!

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Over 60 years Service to Industry

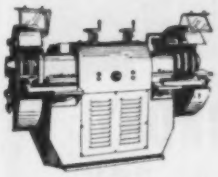
GRINDERS

EASIER, FASTER, MORE ECONOMICAL FOR ALL GRINDING OPERATIONS.

Swing Frame Grinder

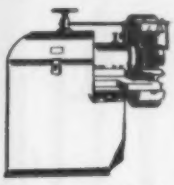
Portable 1/3 to 7½ hp

America's Greatest and Most Complete Line



Dual Motor Vari-Speed Grinder

Write for catalogs and new bulletins



Vari-Speed Single End Grinder

General Purpose Grinder

The United States Electrical Tool Co.

3640 LLEWELLYN ST.,
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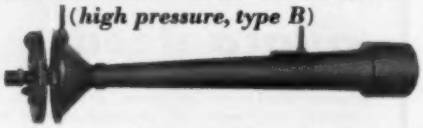
Circle 728 on Page 55

DFC BURNERS

Simple, Rugged, Low Cost

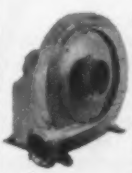
37 DFC Burners engineered for easy, low cost, maintenance-free operation, through long years of hard use. Atmospheric, high and low pressure inspirator, portable, tunnel, gas burners, gas-air mixers, oil burners and blowers. 80 years of burner experience...if you've got a burner problem, let us help you solve it.

INSPIRATOR GAS BURNERS
(high pressure, type B)



Applications: Designed for use with natural or manufactured gas under 2 to 25 PSI. Gives operational economy at low initial investment for boilers, dryers, heaters, incinerators, industrial furnaces, kilns, petroleum processing equipment and roasters. Nine sizes, from 80 to 24,000 cubic feet of 1,000 BTU gas per hour under pressures of 2 to 25 PSI.

Auto-Ratio Proportioning Oil Burner: Automatically maintains accurate air-oil ratio over entire range. Remarkable turn down ratio—up to 20 to 1. For dryers, heaters, industrial furnaces, kilns and roasters.



Centrifugal Motor Blowers: Low pressure blowers with double inlet and 16-oz. positive pressure series with single inlet, used as source of combustion air for industrial burner systems on boilers, dryers, kilns, industrial furnaces, petroleum processing equipment and roasters.

There's a DFC Burner to meet your requirements

DFO-2A

CALL OR WRITE FOR FULL INFORMATION

Denver Fire Clay Company

3033 Blake Street, Denver 17, Colorado

Please send me further information on your full line of Industrial Burners.

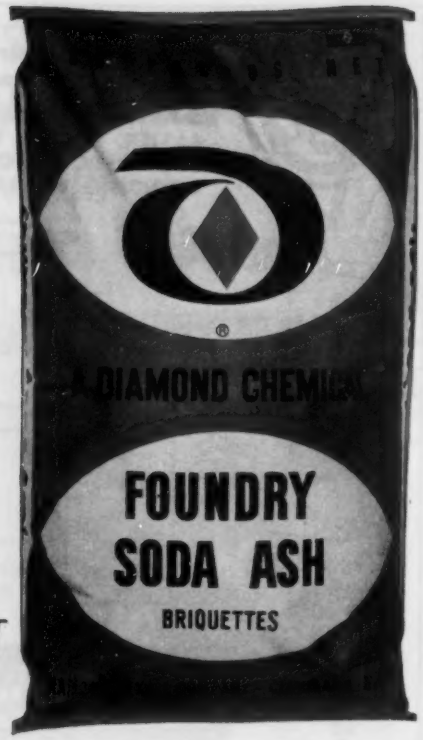
NAME.....

COMPANY.....

ADDRESS.....

CITY AND STATE.....

Circle 729 on Page 55



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DIAMOND FOUNDRY SODA ASH BRIQUETTES

for fast, efficient, desulphurizing action

No inactive ingredients to add to cost. Pillow shaped for easy handling and fast, efficient desulphurization of molten metal in cupola or ladle. Diamond Foundry Soda Ash Briquettes permit greater use of scrap metal in melting, release entrapped gases and increase fluidity. Tough, moisture-proof 100-lb. bags keep them dry, effective and safer to use.

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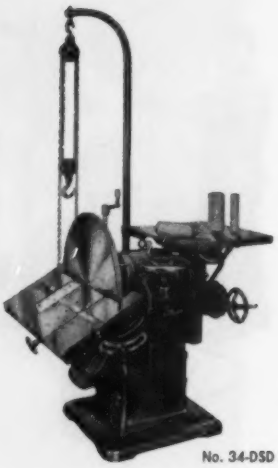
Other Diamond Chemicals for the foundry: MOROC, silicate CO_2 binder, Caustic Soda, Chlorine, Solvents

Diamond Chemicals

"OLIVER" No. 34 DSD DISK and SPINDLE SANDER


No. 34-DSD

Two types of sanding operation are combined in one machine: disk sanding and oscillating spindle sanding. Grinds non-ferrous metal patterns or aluminum parts. Highly flexible, efficient design. Table tilts to 45 degrees one direction, to 10 degrees in opposite direction.

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OLIVER MACHINERY COMPANY
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MURPHY PISTOL SPRAYER guaranteed

2922

Forces blackening into pores and pockets of molds. Sprays silica wash, oil, or water equally well. Used also to sand blast, to clean automobile and diesel engines, to spray centrifugal molds. Standard of the foundry field for more than 50 years. Priced from $17.25. Write for quantity discounts.

(Also furnished in a deluxe model with air pressure reducing valve, 20' of air hose, and 5' of suction hose, both of superior quality, oil and acid resisting plastic.)

Ask your foundry supply dealer or —

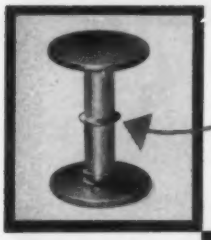
Write for FREE Data Sheet No. 2922

JAMCO

JAS. A. MURPHY & CO., INC.
1425 EAST HIGH STREET, HAMILTON, OHIO

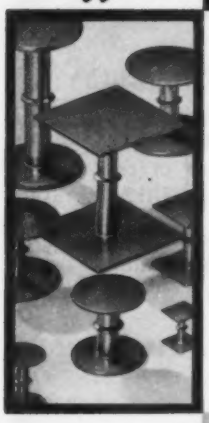
Circle 730 on Page 55

Circle 732 on Page 55



it's the fin that stops leakage

Buffalo LEEK-PRUF-CHAPLETS



Castings of uniform density are assured with "Buffalo" *Leak-Pruf* Chaplets. Exclusive fin design of both Double and Single head types prevents leakage and assures positive fusion with molten metal. There is no recess in the stem to weaken the structure. Thoroughly coated to insure instant fusion. "Buffalo" Chaplets burn in more easily without chilling.

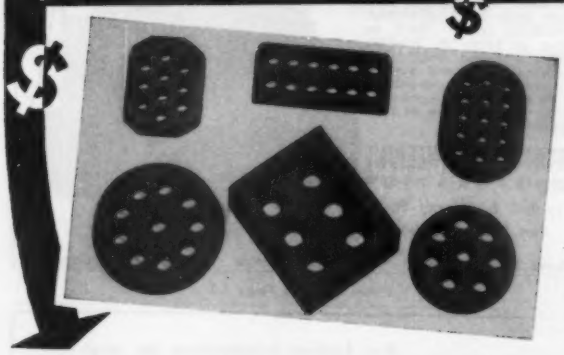
A wide variety of other types is also available to meet your specific molding needs exactly. For complete information, request Catalog No. 20.

Trial samples of any chaplets furnished without charge.

Combined Manufactured by
SUPPLY & EQUIPMENT CO., INC.
211 CHANDLER ST., BUFFALO 7, N. Y.

Circle 733 on Page 55

Save Money with RUDOW STRAINER CORES



Custom Made • Will Duplicate Your Sample or Drawing • Unlimited Design Range • High Heat Resistance • Extra Hard • Saves Time—Trouble

RUDOW quality Strainer Cores cut rejects, cut costs, keep castings free of oxides, slag and impurities—simplify gating control and metal flow, for greater production. We offer you Free Samples of RUDOW Strainer Cores—made like your sample, or from your drawing. Write today—or phone MAin 6-1163.

SEND FOR FREE BULLETINS, PRICES ETC.

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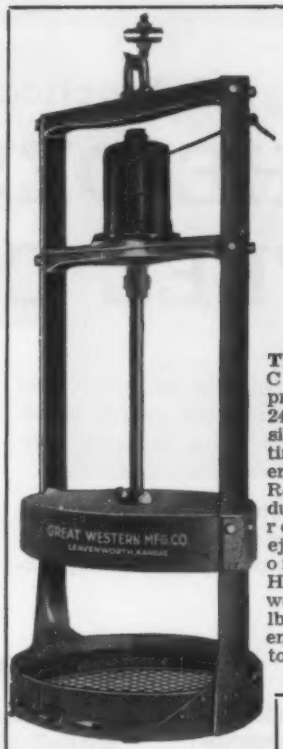
Circle 734 on Page 55

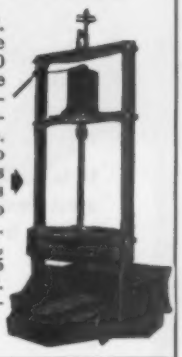


RUGGED DURABILITY AND PRECISION ACCURACY!

Combs Gyratory Riddles

"Greatest Name in Motion"

TYPE "CS". Complete price $435.00 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ⅓ H.P. enclosed motor.



TYPE "CR". Complete price $425.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.

TYPE "HL". Price $315.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20" Sieve, $330.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $600.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas Phone MU-22201
☐ Send Additional FREE Information
NAME
ADDRESS
CITY STATE

Circle 735 on Page 55

A Practical Guide To

THE DESIGN OF STEEL CASTINGS

This highly specialized book deals with steel castings design from the view point of soundness, economy in production and good engineering design.

It is an up-to-date study of the problems of steel castings design and is well illustrated by one hundred and twenty one working diagrams.

It is recommended for all designers, draftsmen, engineers as well as practical steelfounders and students who are concerned with the specification, design and production of cast steel components for all purposes.

This English edition has been prepared by the British Steel Castings Research Association.

Price $3.00 Postpaid

BOOK DEPARTMENT, FOUNDRY — 1213 WEST 3RD STREET, CLEVELAND 13, OHIO

Circle 736 on Page 55

SINCE 1919

A RELIABLE SOURCE

of

QUALITY PATTERNS, SHELL MOLDS, PERMANENT MOLDS AND DIE CASTING DIES.

CENTRAL PATTERN CO.

QUINCY, ILL. TELEPHONE: BA 2-0947

40th YEAR AT THE SAME STAND

Circle 737 on Page 55

PUT THE SCREWS ON SAND CONDITIONING COSTS WITH A RINGLIFT CONDITIONER!

The Ringlift machine not only conditions sand at the lowest cost per ton, it does a more thorough job than any other sand conditioner available today. We'll be glad to prove it. Ringlift picks up sand from floor, screens, cools and aerates it, magnetically separates metal, moistens sand and returns it to floor in neat windrows.

STATES ENGINEERING CORPORATION

245 E. Murray St.
Fort Wayne, Indiana

Sand Preparation • Mechanization • Plant Layout

Circle 738 on Page 55

Use an Inquiry Card

For further information on anything described or advertised in this issue . . . . . .

SEE Page 55

HARTLEY Controls CORPORATION • NEENAH • WISCONSIN

Originators of Fully Automated Sand Systems for Foundries

■■■ Full details will be sent promptly on complete systems • Sand Controls • Moisture Controls • Mixer Timers • Bond Feeders • Bin Controls • Mixer Selectors • Pneumatic Transporters

Circle 739 on Page 55

Of course foundries will need engineering assistance.

For example, here are just a few of the engineering principles applied daily in foundries everywhere . . . . . .

GATING & RISERING	Fluid Flow	Solidification
	Bernoulli's Theorem	Nucleation and
	Hydraulic Principles	Crystal Growth
	Feeding Range	Heat Transfer
	Surface Tension	Temperature Gradients
MOLDING	Sand Characteristics	Permeability
	Clay Minerology	Thermal Conductivity
	Solidification Rates	Compaction
	Colloidal Chemistry	Flowability
	Adhesion and Cohesion	Heat Extraction
MELTING	Combustion	Reaction Rates
	Thermodynamics	Equilibrium Constants
	High Temperature Laws	Free Energy Equations
	Heat Balances	Solubility Principles

As you know, well trained foundry engineering talent is in short supply. Where are you going to get these men when you need them? The answer is this: You can help create a pool of foundry engineering talent by participating in the F.E.F.'s educational program. Write today for our booklet, "Let's Look Ahead."

Foundry Educational Foundation

1138 TERMINAL TOWER BUILDING • CLEVELAND 13, OHIO

The Foundry Educational Foundation does not pay for this advertising. This space has been contributed by FOUNDRY magazine in support of FEF's constructive program for foundry industry progress through education.

Circle 717 on Page 55

How to add Titanium to Aluminum

ECONOMICALLY!
EASILY!

use **B&A®**
POTASSIUM TITANIUM FLUORIDE (K_2TiF_6)

Whether your process is smelting or casting, you'll find B&A Potassium Titanium Fluoride costs less than other methods of incorporating titanium into aluminum alloys. This easy-to-use salt can help lower your production costs and improve the quality of your aluminum and aluminum products.

Here's how: In smelting, add B&A Potassium Titanium Fluoride after the metal has been treated with B&A Potassium Fluoborate or any other good purifying flux and the dross removed. This addition can be made *directly* to the pot when temperatures are in the range of 1450° F or higher. In casting, use either a mixture of this salt with B&A Potassium Fluoborate (for lower melting point) or, more conveniently, use B&A Potassium Titanium Fluoride–Potassium Fluoborate Eutectic mix.

You get all these benefits:

- **lower cost**
- **finer grain structure**
- **higher tensile strength**
- **greater elongation**
- **better machinability**

For further information, call or write the nearest B&A office listed below. Why not right now?

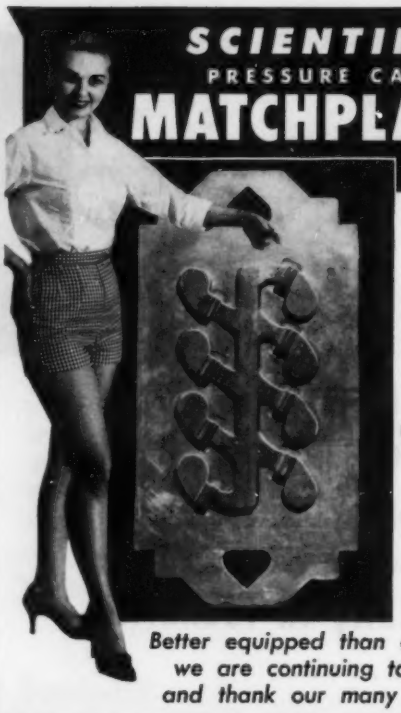
BAKER & ADAMSON® Fine Chemicals

Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport Buffalo • Charlotte • Chicago • Cleveland • Denver • Detroit • Houston Jacksonville • Los Angeles • Milwaukee • Minneapolis • New York Philadelphia • Pittsburgh • Portland (Ore.) • Providence • St. Louis San Francisco • Seattle

Circle 742 on Page 55



SCIENTIFIC PRESSURE CAST MATCHPLATES

"BUILT WITH *EXTRA* CARE"

Not a single matchplate leaves the Scientific Plant without rigorous 7-point inspection.

Better equipped than ever before, we are continuing to progress and thank our many customers.

THE SCIENTIFIC CAST PRODUCTS CORP.
1390 East 40th Street • Cleveland 3, Ohio

Circle 743 on Page 55

CENTRIFUGALLY CAST

AUTOMOBILE CYLINDER LINERS

DIESEL ENGINE LINERS

BRONZE BUSHINGS

on the new WATER-COOLED Model M-WC
(Illustrated)

Utilizes low cost permanent molds of available steel tubing to produce gray machinable cast iron or bronze bushings. Water cooled molds can be maintained at either high or low temperature easily. High or limited production in very small space with unskilled labor. Completely safe for workmen. Simple, sturdy equipment. Quick changeover from one mold to another. Practically 100% metal yield of high quality, denser castings. Metal porosity eliminated.

Write for New Bulletin # 257 Illustrating Model M-WC

RESEARCH FACILITIES

We have available an Experimental Foundry equipped for ferrous and non-ferrous melting for both vertical and horizontal centrifugal casting production. Our facilities are available to foundries for research or trial centrifugal castings at low cost.

Centrifugal Casting Machine Co.

P. O. Box 947 **Tulsa 1, Okla.**

Circle 744 on Page 55

CLASSIFIED ADVERTISING

• HELP WANTED

FOREMAN

We are looking for a first class foreman with real experience in gating and rigging of high quality aluminum and bronze sand castings to take charge of a 4—5 molder shop in Central New England.

The man we are looking for must be of potential superintendent's caliber because this will be his next step up. This is a genuine opportunity for a first class man. Please state your background in full, minimum salary requirements and marital status.

BOX 525, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ENGINEER

With substantial foundry design and layout experience. Knowledge of modern material handling equipment and material flows required. Real opportunity with excellent salary, bonus and profit sharing. Degree is essential. Send complete details in confidence.

BOX 532, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

NONFERROUS FOUNDRY SUPERINTENDENT

A good aggressive, production minded man (preferably engineer) with proven supervisory experience, required for ultra modern brass small casting captive foundry, producing wide variation repetitive pressure castings. Position backed by staff for quality, methods, budgeting, production control, maintenance, etc. Equipment includes induction melting, automated and standard mechanized production lines. Location, Ontario, Canada. Applicants should write in confidence, enclosing resume, references and salary expected. Address: Box 523, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED METALLURGIST

For medium sized steel foundry—Chicago Area, 6000 lb. Electric Furnace. Must be able to melt and run chemicals. Send resume and references to Box 510, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT

Mid-west nonferrous foundry, over $1,000,000 annual sales. Floor and production molding in sand, aluminum permanent mold and heat-treating. Position backed by staff for departmental budget, quality, metallurgical control, methods, standards. Young, aggressive management planning for growth. State experience, qualifications, salary. Address: Box 511, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

REFRACTORY METALS

Sales Engineer in newly developing electron beam refractory metals field. Location in San Francisco Bay Area. College education with experience in refractory metals industry desired. Write:

PERSONNEL MANAGER
STAUFFER-TEMESCAL COMPANY
1375 So. 47th STREET, RICHMOND, CALIF.

MAINTENANCE FOREMAN WANTED

West Michigan manufacturer with captive iron foundry has a challenging opportunity for a Maintenance Foreman. Must have had at least 5 years' foundry maintenance supervisory experience and be an aggressive organizer and manager. Must be strong in preventative maintenance programs. Age 30-45 and must be a high school graduate. Salary and bonus, liberal insurance and pension. Address: Box 508, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL SUPERINTENDENT WANTED

For malleable iron foundry. Applicant must have had experience in production shop. Metallurgical background desirable. Please state age and experience in reply. Must be familiar with malleable iron gating, molding technique, etc. Address: Box 516, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

FIRST CLASS MELTER WANTED

Experienced Electric Arc Furnace, Acid Practice, Carbon, Low Alloy Steel. All replies confidential. West Coast location. Address: Box 539, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PLANT MANAGER'S ASSISTANT

For cast iron plumbing fixture plant, needs rounded out knowledge to back up manager. Address: Box 518, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

PRECISION FOUNDRY MANAGER

Graduate metallurgical engineer. Twenty-one years' experience ferrous and nonferrous foundry practice. Cost and quality minded with metallurgical sales experience. Has developed several precision casting processes, both ferrous and nonferrous. Presently employed as foundry technical consultant. Address: Box 544, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Experienced in all phases foundry operations and administrative functions including sales, accounting and technical training. Desire opportunity with challenge. Age 42. Address: Box 542, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY AND PATTERN ENGINEER

With sound knowledge of modern methods, stress analysis and casting design, desires position where this ability can be utilized. Address: Box 509, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES MANAGER

PRESENTLY EMPLOYED AS SALES MANAGER BY LEADING AIRCRAFT STEEL FOUNDRY. PREVIOUSLY ASSISTANT SALES MANAGER FOR 200 TON A DAY GRAY IRON-NODULAR IRON PRODUCTION SHOP. DESIRES POSITION AS SALES MANAGER FOR AGGRESSIVE GROWTH COMPANY. EXCELLENT BACKGROUND AS APPRENTICE, ASSISTANT SUPERINTENDENT, CHIEF METALLURGIST, MARKET ANALYST, CONTRACT PROPOSAL, ADVERTISING AND SALES MANAGER. AGE, 43. MARRIED. SALARY $15,600. ADDRESS: BOX 531, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

FOUNDRY FOREMAN

Experienced floor molding, machine, and coreroom supervisor, in steel and meehanite, jobbing or production shop. Desire position with possibility for advancement. Age 36, married, willing to relocate. Box 524, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST OR ASSISTANT MANAGER

Young, ambitious college graduate 12 years' experience in all phases of malleable and gray iron including supervision, melting, sand, heat-treat, gating, lab, etc. Fully qualified to assume responsible position with a quality minded firm. Address: Box 522, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COMPETENT FOUNDRYMAN

Desires change. Will assume full responsibility for medium size jobbing foundry. Prefer Midwest location. Address: Box 535, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Desires position in iron or ductile production foundry. Forty-eight years old, college degree and twelve years as foundry and plant superintendent. Consider consulting. Address: Box 538, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER

Needs new challenge. Competent and progressive. Will relocate. Prefer jobbing foundry with range of castings from 1 lb. to 30 tons. Address: Box 536, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Thirty-four years' experience, ferrous and nonferrous practical and technical, twenty years' supervisor. Prefer small shop. Now employed. Age 55. Address: Box 533, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

DOES YOUR TOP MANAGEMENT TEAM

need a resourceful, aggressive and intelligent individual with imagination, productivity and integrity plus a diversified gray iron foundry experience. Production and jobbing (up to 20 tons). Engineer graduate with added business education. Journeyman. Middle thirties. Currently earning $11,000. Will go anywhere for challenging position with growth potential.

BOX 534, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

TECHNICAL SALES REPRESENTATIVE

Experienced technical sales representative to represent a foundry supply manufacturer or equipment manufacturer in Michigan, Ohio and Indiana. Practical and technically trained Supervisor in Iron and Steel. Address: Box 541, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON METALLURGIST

Twenty years' practical experience in acid and basic cupola metal control. Age 49. Will relocate, mid-west. Address: Box 540, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CASTING SALESMAN

Casting Salesman available. New York-New Jersey area. Address: Box 543, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER-SUPERINTENDENT

Graduate foundryman experienced in all phases of gray iron mechanized foundry operations, up-to-date on latest developments and methods, cost and quality minded, now employed, desires relocation including overseas assignment. Address: Box 530, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT

Progressive, practical and technical trained in all phases of ferrous and nonferrous jobbing and production foundries. Twenty-two years as top supervisor. Quality and cost minded. Good trouble shooter. Age 47. Now employed. Minimum $14,000. Address: Box 529, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

REPRESENTATIVE WANTED

In your territory. From your desk you can earn a substantial addition to your income. Only written contacts with your clients! Write for particulars and further details to Verlag Karl Kuhne Publishing Co., Vienna 66, P.O.B. 128, Austria.

REPRESENTATIVES WANTED

To sell Refractory Specialties (Ladle Linings, Hi-Temperature Cements, Plastics and Fire Brick) to the Foundry and Steel Industry. Territories available, Illinois, Ohio, Indiana, New York State and Canada. Please send complete resume to: Box 515, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANUFACTURERS REPRESENTATIVES

Presently calling on permanent mold and die-casting shops, ferrous and nonferrous sand foundries. New group of ceramic facings and related products. Certain volume territories available. Please state experience, current representation and area covered. Address: Box 526, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRY CONSULTANTS

FOUNDRY CONSULTANT

Specializing in reducing your scrap through sensible gating, intelligent sand control and sound metal practices. Interested parties write. Address: Pat Fleming, 3907 North Harvard, Peoria, Illinois.

FOUNDRY CONSULTANT—NONFERROUS

Sand casting—permanent mold casting—centrifugal castings—in aluminum, brasses, bronzes, 30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, West Palm Beach, Florida. PHONE: TEMPLE 2-8685.

• EMPLOYMENT SERVICE

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **FINANCIAL 6-8700**
JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

FOUNDRY ENGINEER
$9,000 to $11,000

Young Engineer, interested in assured future with rapidly expanding, progressive foundry where competence is rewarded with advancement. Client assumes all expenses. Contact Bill Newell in confidence.

MONARCH PERSONNEL
28 EAST JACKSON BLVD. CHICAGO 4, ILL.

JR. FOUNDRY METALLURGIST
$7,200 to $8,400

Promotable type young man to join rapidly expanding organization that places a great deal of emphasis on engineering proficiency. Client pays fee. Contact Bill Newell in confidence.

MONARCH PERSONNEL
28 EAST JACKSON BLVD.
CHICAGO 4, ILLINOIS

• ACCOUNTS WANTED

REPRESENTATIVES AVAILABLE

We desire to add foundry supply line, equipment or castings to our present line. Two man sales force with 15 years' foundry experience. 5000 sq. ft. warehouse space available if needed. Now covering western Pennsylvania and Eastern Ohio. Address: Box 514, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRIES WANTED

WANTED TO BUY

Operating gray iron jobbing foundry capacity eight to ten molders 200 mile radius of Chicago. Address: Box 527, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED TO BUY

Foundry-Gray Iron—location Southern States—15 or 20 molders—squeezer and floor work. Address: Box 517, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED TO LEASE

Or lease purchase a small foundry. Must have direct arc or induction melting capacity of 800 to 1000 lbs. per hour. Good cleaning and heat treating facilities. Address: Box 507, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRIES FOR SALE

FOUNDRY FOR SALE

Going business, pour 10,000# a day: 25 man foundry, gray iron: $200,000 year volume business. Will sacrifice. Address: Box 537, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOR SALE

Fully equipped now operating gray iron foundry in Western New York State for sale at great sacrifice. Reason for selling, present owners want to retire and settle an estate.

BOX 520, FOUNDRY

PENTON BLDG., CLEVELAND 13, OHIO

FOR SALE
MODERN BRASS, BRONZE & ALUMINUM FOUNDRY AND PATTERN SHOP

Thirty employees, now can accommodate many more. Prosperous, established coastal California 1921. Approximately 30,000 sq. ft. Overhead sand system. Owner ill, wishes to retire.

BOX 506, FOUNDRY
PENTON BLDG., CLEVELAND 13, OHIO

• WANTED-TO-BUY

WANTED

1000# per hour top charge Electromelt furnace. Should have 800 KVA Transformer.

BOX 521, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED TO BUY

175 K.W. or 200 K.W. Induction Melting Unit—960 cycle—440 Volt M.G. Type.

BOX 528, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• FOR SALE

FOR SALE

1 Ingersoll Rand Air Hoist, Model B, push-button control, 1000 lb. capacity . . . $225. 1 Ingersoll Rand Air Hoist, Model C, push-button control, 2000 lb. Capacity . . . $325. Address: A & B Foundry, Inc., 835 North Main Street, Franklin, Ohio.

FOR SALE

One Model 3F Simpson Mix-Muller, 60 cu. ft. batch, used four years, excellent condition. Address: Box 513, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

LIQUIDATING FOUNDRY

A. C. & F., BERWICK, PENNSYLVANIA

All Kinds Used

Foundry Machinery & Equipment

1500 Tons Flasks

Steel—Cast Iron—Aluminum

Send us your inquiries

INDUSTRIAL DISMANTLING

& SALVAGE CO.

EASTON, PA.—BOX 332—BL 3-6253

FOR SALE

One Series 550 Reda Reverberatory furnace. Equipped for burning gas, oil, or a combination of both. Motor driven tilt. Spare linings and baffles. Used for less than a dozen heats on gray iron. $2200 complete. Washington Stove Works, Everett, Washington.

FOR SALE

Davenport Model 34 Jolt Rollover 15" Draw total Depth 22" Molding Machine Pattern Plate 34" x 48". Five years old. Never Used. Must Sell. Address: Fairfield Aluminum Casting Co., Fairfield, Iowa. Phone 1010.

FOR SALE

1 B & P Mulbaro, with automatic cycling unit and 2 barrows, 2 years old
1 BLYSTONE MIXER, complete, 300# capacity
1 SLY Tumbling Mill, 36 x 60 with Master electric drive and brake
1 Mold Dryer, 500,000 BTU, 2000 lb. Sand per hour. Like new

MEECH FOUNDRY, INC.
9906 MEECH AVE. CLEVELAND 5, OHIO
MICHIGAN 1-5550

• FOR SALE

LATE TYPE
OVERHEAD CRANES
1/3 REPLACEMENT PRICE

(26) Northern Engineering Overhead Traveling Cranes—6 Ton Capacity. Hevi-Duty—230 Volt D.C.—43' Span—20' Lift (room on drums for 40' lift)—Hoisting Speed 80 FPM—Trolley Speed 150 FPM—Bridge Speed 400 FPM. Equipped with magnetic EC & M Control, dynamic lowering, roller bearing trucks. Cab operated. Convertible to pendant operation.—Rolled girder construction permits easy change of span.

(1) Northern Engineering 50 Ton—3 Ton Auxiliary Overhead Traveling Crane—36' span—42' lift, 440 volt—60 cy.—2 phase A.C.—main hook 6 FPM, auxiliary hook 20 FPM—trolley speed 75 FPM—bridge speed 100 FPM.

Indoor/outdoor service—available at less than 1/3 replacement price—new 1943—used approximately 4 years.

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Direct Inquiries To: Arnold Landesberg
LIPSETT INCORPORATED

405 Lexington Avenue, Chrysler Bldg., New York 17, New York—Phone: Murray Hill 7-2700—Philadelphia Sales Office: Trinity 8-8100

FOR
IMMEDIATE SALE
INDUCTOTHERM CORP. 50 K.W. INDUCTION MELTING FURNACE PURCHASED NEW AUGUST 1957

50 K.W. 3000 cycle equipped with a 50 lb. tilting furnace. Boque vertical motor generator set. 75 H.P. Motor 220/440 Volts—3 Phase. G. E. Motor Starter.

Condition Like New!

Capacity—55 lbs. steel in 35 minutes. Now in operation and we will demonstrate in our foundry at your convenience.

Replacement cost of this unit is $17,500 offered at $11,000 for acceptance by October 1.

L. E. JONES COMPANY, INC.
1200—34th AVENUE
MENOMINEE, MICHIGAN
PHONE: UNION 3-2181

SAND BLAST EQUIPMENT
SELL—BUY—TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

Specialized Wheelabrators and Pangborns converted to your requirements.

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	$7000.00
6' Pangborn Swing Table	$6000.00
Pangborn GF2 Air bbl.	$ 450.00
Pangborn 53 EN2 Hand cabinet.	$ 325.00
Pangborn Auto Peening cabinet.	$1100.00
14 LG5 Pangborn Multi-table	$9000.00
48 x 48 Wheelabrator Tumblast.	$4000.00
42 x 48 Wheelabrator Tumblast.	$2500.00
27 x 36 Wheelabrator Tumblast like new	$4000.00
27 x 36 Wheelabrator Rubber Belt	$3000.00
4' Wheelabrator Table Blast	$2000.00
6' Wheelabrator Table Room	$6000.00
Rumelin 8 x 8 room	$1200.00
Pressure Tanks, all types	$150.00 up
Vapor Blast cabinets	$ 400.00

All types and sizes of Hand cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. JEFFERSON
DETROIT 9, MICHIGAN
VI. 3-6750

• FOR SALE

FOR SALE

1—Simpson #0 Muller—Style M (never used)
1—Simpson 18" Muller
1—Lancaster Mixer, Model EGB-4
1—Lancaster Mixer, Model EAG-3
3—Link Belt Roto Louver Rotary Dryers. Models 207-10, 310-16 and 604-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

FOR SALE

MOULDERS FRIEND—Two-way 60" w/New Extra Brush. Good.
SIMPSON MULLORS—#1 UD w/Loader & Aerator—#1½ UD—#2 Open Gear. Good.
SPEEDMULLOR #30—Used only a few months. Excellent.
TOLEDO and FAIRBANKS SCALES—Platform, 10M Cap. Truck-Type 9' x 22' 50M Cap. Good.
TABOR Jolt Squeeze Pin Lift—10" Cylinder—used only a few months.
Other good equipment—for inspection call

W. O. McMAHON
P. O. BOX 5799 HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONES: TREMONT 1-2088 and 9-6170

FOR SALE

FORDATH Core Sand Mixer, 370 lbs capacity, 3 ton per hour. Unused. $1250 less electrics.
TITANETTE Core Blower. 36 lbs. sand chamber, air clamps, supporting stand. Take box 24" x 8" x 8". $1100 complete.
Cable stripping machine. Take single lead or plastic cable. $175 less electrics.

DREW BROWN LIMITED
5410 FERRIER STREET, MONTREAL, CANADA

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REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE, INC.
512 LINDEN AVENUE
DAYTON 3, OHIO
PHONE: CL 2-2701

FOR SALE

27" x 36" American Wheelabrator, Serial Number A63376. Only $2450. Address: Weldon F. Stump, 4835 Crestridge, Toledo 13, Ohio.

FOR SALE

MOTOR-GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51 — Rochester 1, New York

FOR SALE

One Model 3 Unit Drive Simpson Muller, with Bucket Loader, Double Discharge Hoppers, Mill Belt, Bucket Elevator, National System Aerator, 14 ft. long Prepared Sand Conveyor, 50 ton Sand Storage Bin. All in good condition. Address: Box 512, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

HAVE YOU EVER NOTICED

the many types of headings under which classified ads are listed? There's one for every want—if you want to obtain qualified personnel, want to sell used machinery, want to buy equipment, or want a better position, you should advertise in the classified section of FOUNDRY.

classified
advertising dept.
FOUNDRY
Cleveland 13, O.

AVAILABLE TOP QUALITY FOUNDRY EQUIPMENT DUE TO MERGER OF IDEAL FURNACE COMPANY, MILAN, MICHIGAN AND HOMER FOUNDRY CORPORATION, COLDWATER, MICHIGAN

Complete plant facilities and major portion of foundry equipment are being offered. Liquidation by owners.

Mullers
Shakeouts
Belt Conveyors
Molding Machines (27)
Compressors
Roller Conveyors
Monorails
Air Hoists
Ladles
Scales
Sand Systems
Fork Trucks
Payloaders
Core Blowers
Core Ovens
Transite Core Plates
Aluminum Bottom Boards
Pattern Shop Equipment
Machine Shop Equipment
Cleaning Equipment
Steel Flasks
Hines Flasks

Most of this equipment is under power. Plant will be opened for your inspection and selection of equipment on September 6, 1960.

The Location: 15 miles from Willow Run Airport on Route 23, Milan, Michigan.
Phone: Hemlock 2-3500—4500 Ask for Mr. Robert Yaeger
Mail inquiries to: Ideal Furnace Company, General Delivery, Milan, Michigan

Circle 866 on Page 55

Two *OUTSTANDING VALUES* from UNIVERSAL

BLAST CLEANING UNIT

96" WHEELABRATOR SWING TABLE

Capable of handling work 96" in diameter. 42" work height clearance, 10,000 lb. loads.

LIKE NEW CONDITION—SEE IN OPERATION.
Less Than Half of Today's Replacement Value.

SAND HANDLING SYSTEM

NATIONAL ENGINEERING UNIT

Consisting of: NO. 1½ Simpson U.D. Muller with water meter, National Screen Master Preparator, Skip bucket loaders, 20" x 20' belt conveyor, "Elevayor", 2 Moulder's hoppers.

1957 unit in LIKE NEW CONDITION
Dismantled in our warehouse
Yours for Less than Half of today's replacement value!

PARTIAL LISTING OF OUR REGULAR REBUILT MACHINERY STOCK

AIR COMPRESSORS
1—75 hp INGERSOLL-RAND water cooled, horizontal
1—100 hp WORTHINGTON air cooled, 2 stage

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent, Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—15" Cont. WHEELABRATOR Tumblast
1—26" Cont. WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
1—27" x 36" WHEELABRATOR Tumblast
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast
1—48" x 48" WHEELABRATOR Tumblast
1—96" WHEELABRATOR Swing Table
1—1-A WHEELABRATOR Multi-table
1—WHEELABRATOR Peening Cabinet
1—WHEELABRATOR "K" Pressure Cabinet
1—PANGBORN TABLAST, 8' Table
1—PANGBORN Air Blast Room
1—PANGBORN PIPE CLEANING CABINET
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round
1—Model 43 LIQUAMATTE Wet Blasting Cabinet
1—WHEELABRATOR Sheet Cleaning Machine, 48" wide stock

CONVEYORS
1—HEWITT-ROBINS Oscillating, 18" W x 40' L
1—HEWITT-ROBINS Vibrating, 18" W x 10' L, Model VC-1
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS
10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL 8B-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—SAN-BLO #40-P-1, 40# core
1—TACCONE #4D, 10" Draw Stroke Cyl.

DUST COLLECTORS
COMPLETE STOCK—both Wet & Bag Types

FURNACES—DIRECT ARC MELTING
1—250 lb. LECTROMELT, Side Charge
1—500 lb. LECTROMELT, 200 KVA trans.
1—1000 lb. SWINDELL
1—2000 lb. HEROULT
1—2000 lb. SWINDELL, 3/60 1000 KVA.
1—1½ Ton HEROULT
1—11' LECTROMELT Top Charge
1—12' SWINDELL Hyd. Top Charge
1—10' Top Charge Furnace

FURNACES—INDIRECT ARC
1—10# DETROIT
1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AAD P, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING & HEATING
1—30 KW ECCO Hi-freq. Vacuum Melting
1—35 KVA AJAX 60 cy., alum.
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—30 KW LEPEL, water cooled spark gap

FURNACES—GAS & OIL
1—1000# HAUSFELD hand tilt, Oil fired, alum or magnesium
1—1 #900 JC STROMAN, gas. Like new
1—6000# STROMAN, gas fired

FURNACES—HEAT TREAT
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—210 KW LINDBERG conveyor box type
1—7' Rotary G. E., 200 KW, 1950° F
1—36" x 36" WESTINGHOUSE Pit Type
1—10" x 12" x 24" LINDBERG, 2500° F. Hydrogen

MOLDING MACHINES
Jolt Rollover Pattern Draw
2—DAVENPORT #34SA w/air clamps, 34" x 48" table, 2500#
2—DAVENPORT #40SA, 40" x 60" table, 3000#
1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42" x 78"
2—HERMAN 7500#, 40" x 50" tables
1—HERMAN 3000#, 30" x 66" table
1—HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type
5—HERMAN 1500# to 30" x 48" tables
1—INTERNATIONAL 30" x 12", Type G, 28" x 35" table
2—INTERNATIONAL, 13" x 17" tables
1—J&J #918, 40" x 48" table, 18" draw
1—J&J #815 RB, 30" x 40" table, 15" draw
1—J&J #612RP, 24" x 30" table, 12" draw
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask 64" x 57"
4—TABOR 40" x 60", 1500 & 3000#
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable, 600#
1—TABOR 20" x 30", w/air clamps, 1000#
2—TABOR 14" x 16" Rockover 150#
1—TABOR 40" x 50" table, 3000# capacity

Plain Jolt
1—INTERNATIONAL, 3' x 4' table, 12" cylinder
1—TABOR 3' x 4' table

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
2—INTERNATIONAL JDP, 1200 x 8", 24" x 26" table, 8" draw, 1200#, port.
2—SPO #305, 750 lb., 20" x 27" table
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift
2—INTERNATIONAL PKL, 20" x 28" table, 14" sq., 5½" draw
2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
1—MILWAUKEE #165, 24" x 30" table, 16" sq., 1700#
1—NICHOLLS 18-44, 6¼" draw.
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
2—OSBORN #716PJ, 22" x 34" table, 16" sq., 8" draw.
5—SPO #2114P, 21" x 27" table, 600#
2—SPO #2116, 21" x 27" table, 11" sq., 6" draw

Jolt Squeezers
2—INTERNATIONAL #12 LJS, 16" x 20"
4—INTERNATIONAL #10 LJS, 16" x 20"
10—OSBORN #275J, 16 x 20" table, 400#
3—TABOR Squeeze-in Head, 16" x 19" table
1—TABOR Yoke Type, 18" x 26" table

MATERIALS HANDLING
1—BYERS Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

MULLERS AND MIXERS
1—B&P #30 Speedmuller w/skip, 3 cu. ft.
1—B&P #40 Speedmuller w/skip, 5 cu. ft.
1—B&P #50 Speemuller with cooling & muitro-matic controls, 7½ cu. ft.
1—B&P Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—SIMPSON #0, U.D., 3' Dia
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft.
1—SIMPSON #1½, U.D., 4'6" dia., 6 cu. ft.
1—SIMPSON #1½, Sep. Dr., 4'6" dia., 6 cu. ft.
2—SIMPSON #2, enc. gear or open gear, 6' dia, 14 cu. ft.
2—SIMPSON #3, 8' Dia. Sep. Dr., or U.D. 20-25 Cu. Ft. Batch

LADLES
Bottom Pour
4—MODERN, 49" x 49"
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top

Lip Pour
1—WHITING 52" x 52" top dia. geared

Cylindrical
8—WHITING, 26" L x 25" dia., 1100# iron
7—WHITING, 19" L x 22" dia, 600# iron
3—WHITING, 38" L x 28" dia, 2200# iron

OVENS
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22' x 12' x 10'
3—GENRICH, Elec. elevator type.
1—LANLY, elec. 5'11" x 3'2" x 7'3" H

SAND CONDITIONING
2—HANDY SANDY Units, Model HSTGT
1—READY SANDY Unit
1—B & P Nite-Gang
2—B&P Screenarator, Model "M"
1—LINK-BELT Revivifier
1—MOULDER'S FRIEND, 50" cutting reel
1—ROYER Jr., 7-10 tons/hr., ½ Hp
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER, NC-4, 10-15 tons/hr. 1½ Hp
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp
1—SIMPLICITY Type SOBG, 4' x 5' screen
6—SIMPLICITY Shakeouts, 3'x10', 4'x8', 4'x10', 5'x8'

SAND SLINGERS
1—B&P Stationary, 2 speed, 19" head, 4" tip with plate feeder
1—B&P Stationary, Single Speed
2—B&P Tractor Type, 16" head
1—B & P Tractor Type 19" head

MISCELLANEOUS
1—BLASTCRETE Model PM-1 Cupola Gun
1—KANE & ROACH WIRE STRAIGHTENER Model DX-5
FLASKS, CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener
10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedsetal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP
1—62" Magnet
14—MOULDER's Hoppers, various sizes

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SAND MULLERS

CLEARFIELD

MODEL	PAN DIA.	BATCH CAPACITY
404	4'	400 #
610	6'	1500 #

BEARDSLEY & PIPER

MODEL	BATCH CAPACITY	AIR COOLED
30	4 cu. ft.	Yes
30	4 cu. ft.	No
60	12 cu. ft.	Yes
60	12 cu. ft.	No
70	15 cu. ft.	No
80	20 cu. ft.	Yes

ALL CAN BE EQUIPPED WITH DUST HOODS, SKIP HOIST LOADERS, MULTRAMATIC CONTROLS, ETC.

2—B&P #3½ Mulbaros.
1—SIMPSON Porto-Muller.

SIMPSON

MODEL	PAN. DIA.	BATCH CAPACITY	TYPE DRIVE
0	3'	175 #	Sep.
1-H	4'	500 #	UD
1½	4'-6"	700 #	UD
2	6'	1500 #	UD
2	6'	1500 #	Encld.
3	8'	3000 #	UD
3	8'	3000 #	Encld.
3½	9'-3"	5000 #	UD

ALL CAN BE EQUIPPED WITH NATL. ENG. STRAIGHT LIFT SKIP HOIST BUCKET LOADERS.

LANCASTER

MODEL	PAN. DIA.	BATCH CAPACITY
EA4	59"	9 cu. ft.
EBG-4	59"	9 cu. ft.

JOLT SQUEEZE PIN LIFT MACHINES

MODEL	TABLE SIZE	PATTERN DRAW	SQ. CYL. DIA.	JOLT CAP.
PKL-12	18" x 24"	5½"	12"	600 #
PKL-14	20" x 28"	5½"	14"	1000 #
PK-16	20" x 30"	8"	16"	1700 #
MILWAUKEE				
125	21" x 27"	8"	12"	1200 #
145	24" x 30"	8"	14"	1700 #
163	15" x 24"	8"	16"	1500 #
193	19" x 34½"	8"	19"	
195	28" x 39"	10"	19"	3000 #
196	16¾" x 39"	10"	19"	3000 #
244	22" x 32"	12"	24"	3000 #
245	35¼" x 42"	12"	24"	5900 #
248	23¼" x 42"	12"	24"	5900 #
OSBORN				
710-PJ	16" x 25"	6"	10"	500 #
712-PJ	18" x 28"	6"	12"	750 #
714-PJ	20" x 31"	7"	14"	1000 #
716-PJ	22" x 34"	7"	16"	1250 #
SPO				
2114-P	20" x 27"	4"	11"	600 #
2136	21" x 30"	6"	13"	800 #
2146	23" x 31"	6"	14"	1000 #

JOLT SQUEEZE ROLLOVER DRAW MACHINES

MILWAUKEE

MODEL	TABLE SIZE	PATTERN DRAW	SQUEEZE CYL.	JOLT CAP.
167	32" x 33"	12"	16"	1000 #
OSBORN				
332	26" x 36"	9"	16"	750 #
333	32" x 45"	11"	19"	1400 #
SPO				
413-C	24" x 25"	10"	13"	600 #
917-A	26" x 36"	9"	17"	750 #

WHITING 10-TON HYDRO-ARC FURNACE

10' dia. shell, 6'-8" inside depth, 1" steel plate. Cradle tilt, manual & motorized, 9" dia. electrodes. Capacity—18 to 23 tons cupola malleable iron per hour. Holding capacity—16 tons normal, max. 21 tons.
1—ALLIS CHALMERS 2000 KVA Furnace Transformer. 12,000 volt primary, OIWC motor operated tap changer. Entire unit new 1952.

OSCILLATING CONVEYORS

AJAX ENGINEERING (Lo-Veyor)

MODEL	SIZE	CAPACITY in T P H
LC 18-6-24	18" W x 24' L	50
LC 24-6-7	24" W x 7' L	70
LC 24-6-21 FA	24" W x 21' L	70
LC 36-6-9DA	36" W x 9' L	100
LC 36-6-14 DA	36" W x 14' L	100
CARRIER CONVEYOR CO.		
Nat. Freq.	24" W x 62' L	25
Nat. Freq.	24" W x 70' L	25
HEWITT-ROBINS		
VC-6	24" W x 120' L	55
VF-3	30" W x 5' L	12
JEFFREY TRAYLOR		
5	24" W x 9' L	50
5	24" W x 21' L	50
5	24" W x 28' L	50
LINK BELT		
Flexmount	8" W x 70' L	15
SIMPLICITY ENGINEERING		
OA-10-JA	24" W x 13' L	150
OA-10-JA	24" W x 11' L	150
OA-10-JA-2	30" W x 7' L	150
OA-10-JA	30" W x 13' L	100
OA-10-JA	36" W x 6' L	150
OA-10-A	36" W x 10' L	200
OA-10-A	36" W x 16' L	200
OA-10-A	36" W x 25' L	600

HANDY SANDYS

NEWAYGO SHS-4-G Super Handy Sandys, Single Hopper, 15 cu. ft. capacity. 4' receiving hopper, air gates, 21' center elevator.
NEWAYGO SHS4-GT Super Handy Sandy, Twin Hopper, 25 cu. ft. capacity, 4' receiving hopper, 21' center elevator.
NATIONAL ENGINEERING Moulders Helper, Twin Hopper, 3000 # capacity, each air operated gates.

SANDSLINGERS

B&P Stationary, Model "DB," 5' jib arm, 4' ram, 19" head, 5" cup, 2-speed, 20/13 HP. Raising & lowering arms or fixed.
B&P Stationary, Model "DB," 3' j.b arm, 4' ram, 19" head, 4" tip, 20/16 HP. Raising & lowering arms or fixed.
B&P "Motive Jr.," 11' jib arm, 4' ram, 16" head, 4" cup, R & L arms, 2-speed, 20/13 HP.
B&P "Motive," 15' jib arm, 9' ram, 2-speed, 25/16 HP. With Raising & Lowering arm.

JOLT PIN LIFT MACHINES

DAVENPORT

MODEL	TABLE SIZE	PATTERN DRAW	JOLT CAP.
34 A-JS	36" x 46"	12"	2500 #
INTERNATIONAL			
JDP 1200x8	24" x 26"	8"	1200 #
JDP 3000x10	48" x 48"	10"	3000 #
JL	32" x 52"	12"	2000 #
JOHNSTON & JENNINGS			
68-SP	25" x 30"	8"	600 #
812-S	30" x 38"	12"	1600 #
1216-S	36" x 54"	16"	3000 #
MILWAUKEE			
1030	28" x 34"	8"	1000 #
1536	32" x 38"	10"	1500 #
2036	32" x 38"	10"	2000 #
2542	38" x 42"	12"	3000 #
3548-6	44" x 46"	12"	3500 #
OSBORN			
540	32" x 52"	12"	2000 #
560	32" x 45"	12"	2500 #
SPO			
305	20" x 27"	4"	750 #
3070	28" x 35"	10"	1500 #

JOLT ROLLOVER PATTERN DRAW MACHINES

DAVENPORT

MODEL	TABLE SIZE	PATTERN DRAW	JOLT CAP.
24 SA	24" x 35"	12"	1000 #
28 SA	28" x 40"	12"	1500 #
34 A	34" x 58"	15"	2500 #
48 A	48" x 82"	24"	6000 #

1—INTERNATIONAL Model "AN," Air Clamp, Air Turnover, Air Draw-Molding Machine, 4500 # capacity. Flask size—40" width by open ends. Draw 20". New 1952. Used six months.

JOHNSTON & JENNINGS			
612	24" x 30"	12"	800 #
815	30" x 40"	15"	1200 #
918	44" x 54"	20"	2000 #
920-RC	44" x 54"	20"	2000 #
1020-RC	50" x 60"	20"	3000 #
OSBORN			
242-W	29" x 42"	12" to 19"	1500 #
244	35" x 52"	16" to 25"	3000 #
403	36" x 44"	12"	1400 #
405	57" x 64"	28"	3000 #
442	21" x 31"	10"	600 #
601	24" x 30"	10"	900 #
602	30" x 36"	12"	1200 #
643	35" x 50"	20"	2000 #
SPO			
505	18" x 23"	6½"	400 #
506	24" x 25"	10"	600 #
508	28" x 30"	12"	1000 #

TABOR

MODEL	TABLE SIZE	PATTERN DRAW	JOLT CAP.
22"	22" x 32"	10"	600 #
22"	22" x 42"	10"	600 #
30"	30" x 40"	12"	1000 #
40"	40" x 60"	15"	3000 #

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THE ACME BARGAIN PAGE

AERATOR
NEWAYGO

BLOWERS
I.-R. 12900 cfm, 100 h.p. 220-440 V, 20 oz.
GE 10500 cfm., 20 oz., 85 h.p., 220 V.
GE 7500 cfm., 20 oz., 59.6 h.p., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 h.p.
SPENCER 7000 cfm., 32 oz.
GE Centrifugal 6200 cfm., 24 oz., 58 h.p.
6000 cfm. INGERSOLL-RAND 32 oz.
SPENCER 3500 cfm., 28 oz., 40 h.p.
SPENCER 2250 cfm., 16 oz., 15 h.p., 220
SPENCER 1350 cfm., 32 oz.
NORTH AMERICAN 1050 cfm, 16 oz.
NORTH AMERICAN 850 cfm.
500 cfm. NORTH AMERICAN 12 oz.
McKee 200 cfm.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 h.p., 220-440 V.
24" x 18' Trough Perm. Magnetic

CONVEYORS, OSCILLATING
24" x 40' Ajax
SIMPLICITY 18" x 24'
SYNTRON 24" x 6'
AJAX 12" x 20'6"
36" x 11', Ajax
8" x 13' Ajax

CORE BLOWERS
CB15 55# cores, Universal blow plate
DEMMLER #4 up to 250# cores
DEMMLER #50
DEMMLER 2EO
DEMMLER 2K
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores, Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
6—OSBORN 193 up to 50# cores
REDFORD #2 & #4

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
2—Despatch ET. Drawer Type

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
SUTTER #500

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—Bondactor #1250 and 1000

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
ROTOCLONE W14 Arrang. A. 5200 cfm.

ELECTRIC MELTING FURNACES
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.

FURNACES
400# Fisher Motorized Tilt, Gas Fired
600# Fisher Stationary
600# Campbell Hausfeld Brass
ECLIPSE 2000# Skeinar Gas, cast iron, or alum.

GRINDERS, MISC.
U.S. #70 Comb. 20" disc & 20"x3"x1½" wh
GARDNER 18" single end disc.
HANCHETT 30" double spindle opposed
GARDNER 26" D.E. Disc
120A Gardner 30" Opposed Disc
Porter Cable BG 8 8" belt
72" Gardner Horizontal Disc
53" Hanchett Horizontal Disc

GRINDERS, SNAG
Marschke 30" x 3", 3 speed snag
5—#6 FOX Single Wheel 24" Snag
U.S. #65 D. E. 30" x 3" x 12"
STANDARD 24 x 2½—15 HP DE Snag

GRINDERS, SWING FRAME
FOX 24" x 3" x 12", 15 h.p.
MARSCHKE 24" x 3" x 12" 20 h.p., 220 V.
U.S. 24" x 3" x 12" 15 h.p., 220-440 V.
2—MARSCHKE 3 h.p., 12" wheel
1—B&D 7½ h.p.

CUTOFF SAWS
DEWALT CUTOFF SAWS for ferrous or nonferrous metals, cutoff or as sprue cutters. Flush blade adaptor takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting of large work. Motor swivels horizontal to vertical in yoke.

HEAT TREATING FURNACES
G. E. Elevator Type 1950° Atmosphere Generator 65" x 16' car. Electric, Late
G. E. Elevator type 2150°—96" x 144" car atmosphere generator, Electric, Late
LINDBERG 1250° 48 x 60 Electric
3—ABBOTT 24" H x 22" Deep x 30" Wide, Gas Fired
HOLDEN #202 1850° Bright Hardening Annealing
25 KW Westinghouse 2000°

HOISTS
6000# Cleveland, w/monotractor travel
6000# Electrolift
4000# Cleveland
4000# Ingersoll-Rand Air
2—4000# Lo Hed, 220/440 V.
4—2000# R & M
4—2000# Ingersoll-Rand Hoists
4—CLEVELAND 2000# Cab type hot metal carriers
1—500# Ingersoll-Rand LC-4
180' Cleveland 12" Rail

INDUCTION MELTING EQUIPMENT
100 KW-Ajax 300# 3000 cycle, 150 h.p. 4 bearings MS set, water cooled, complete controls
30 KW Lepel Spark Gap
35 KW Ajax Tama Wyatt, 60 cycle induction holding furnaces
1000# Ajax Spare Melting Furnaces

LADLES
WHITING 16000# Crane
WHITING 8000# Crane
WHITING 5000# Crane
4000# Industrial Holding

MOLD BLOWER
TACONNE TD4 24" x 32" flask

MOLD CONVEYOR
366'—51—44" x 66" cars

MOLDING MACHINES JOLT SQUEEZE PIN LIFT
8—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff—rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw, Flask size 25½" to 29" wide, 52" long. FACTORY REBUILT
2—MILWAUKEE 165, 24" x 30", 8" draw

JOLT SQUEEZERS
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
2—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table
113 PJ SPO
25—124 Milwaukee Portable Jolt Sq.
6—104 Milwaukee Portable Jolt Sq.

JOLT ROLLOVER DRAWS
HERMAN 10000# late
HERMAN 3000#
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
1—SPO 9032
3—SPO 506
1—SPO 506 SP
2—INTERNATIONAL G
2—TABOR 30 x 52

JOLT SQUEEZE ROLLOVER DRAW
OSBORN 331-332-333
SPO 413D
INTERNATIONAL RES.

PLAIN JOLT
40" x 84" Herman
36" x 60" Herman
2—20" x 30" INTERNATIONAL

MULLERS and MIXERS
#80 B&P
#30 B&P w/skip loader
1—#3 UD Simpson
1—930 Clearfield
CLEARFIELD #404
4—#2 SIMPSON OG
#1 Simpson OG

SAND CONDITIONERS
AMERICAN 51"
JEFFREY SANDITIONER
ROYER NDC—ND2
SCREENARATORS S-M-L

SAND SLINGERS & EQUIPMENT
3—19"—2 speed Stationary
2—14' Turntables
1—12' Turntable
1—8' Newaygo Plate Feeder
4—7' B&P Plate Feeders, 35 & 45 Tons

SAND SYSTEM EQUIPMENT
2—18" x 52' Magnetic Belt
33' Bucket Elevator
28' Bucket Elevator

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic

SHAKEOUTS
3' x 5' SIMPLICITY
3'x 10' SIMPLICITY
5 x 10 LINK-BELT
4 x 8 LINK-BELT
2' x 8' Double Deck

SHELL EQUIPMENT
SHELL PRODUCTS 20" x 30" pattern size w/shell blender and bonding press
TSM4 Shell Molding Machine 20" x 30"

SHOT BLAST
SLY #4, 20" x 30" w/dust collector

SLAG DISPOSAL UNIT
AMERICAN MODEL A

SPRUE CUTTERS
1—MILWAUKEE #85 TON

STRAIGHTENING PRESS HYDRAULIC
225 ton Southwark
150 ton HPM
150 ton Farquhar "C" Frame
100 ton Elmes Hydraulic
100 ton Hannifin Hydraulic
100 ton Watson Stillman "C" Frame
60 ton Lempco 4 post
60 ton Farquhar "C" Frame
25 ton Fox
25 ton Dennison

TESTING EQUIPMENT
120,000# Baldwin Hamilton Tensile
ARLIN Automatic Rockwell, continuous
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
TINIUS OLSON Brinnel Hardness Tester Production Bench

TUMBLING BARRELS
ROTO-FINISH, Model DW 45-36
1—ROYERSFORD, 42" x 72", chain drive
SLY, 24" x 48"; 3 H.P.
SLY, 30" x 60" Duplex.

TUMBLING MILLS
30" x 60"

WHEELABRATORS
27" x 36" American w/skip
48" x 48" AMERICAN w/skip
6' Table PANGBORN
#1 Rotary Table, AMERICAN
20" x 27" AMERICAN, w/rubber belt
AMERICAN #2 Tablast 8-28" tables, late
PANGBORN GD1-Airblast Barrel

WOODWORKING—PATTERNSHOP
HERMANCE 24" Planer
JONES SUPERIOR 48" Double Disc
OLIVER #290 Dbl Arbor, Tilt-Arbor Saw
1—OLIVER 182D, 15" Disc Sanders
CRESCENT 24" Planer
ONSRUD W-244, W-240 & W-304 Routers
8", 12", 20" and 30" Jointers
20" Yates American Band Saw
36" American Band Saw

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EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

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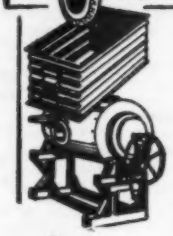

WHEELABRATORS
1—72″ Swingout table
1—96″ Swingout table
3—6 cu. ft. Continuous Tumblast
1—42″ x 48″, 17½ cu. ft. Tumblast with loader
1—36″ x 42″, 11½ cu. ft. Tumblast
1—6′ Table Airblast w/six aux. tables
2—6′ Table Pangborn LF and LE

WANTED!
COMPLETE FOUNDRIES,
SMALL/LARGE.
PROMPT SERVICE.

ELECTRIC FURNACES
1—3000 lb. Heroult Side Charge
1—500 lb. Lectromelt

MULLERS
Simpsons #1, 1½, 2, 3, unit drive
Clearfield #404, 610
Beardsley-Piper #40, 50

LADLES-WHITING
4—25 Tons 2—15 Tons 2—10 Tons

CORE OVEN
1—Di-Electric Model M800-A Thermonic, 30 KW

SANDSLINGERS
1—B-P 22″ head stationary, R&L arm
1—B-P 19″ head stationary, double belt
1—B-P 19″ stationary, riddle type

— **GLENVILLE 1-1222**

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175 hp Synchronous, 2 state IR-XRE

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Wheelabrator 48 x 72 with skip and dust collector, excellent condition.
American 66″ Swing Table, 48 x 48 with skip hoist

Wheelabrator 27 x 36 skip
Wheelabrator 42 x 48 with skip & collector
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Air Blasting Rooms, complete or component parts

CORE BLOWERS
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Demmler 3EO, feeder & semi-automatic cycle
Demmler #1 and #2, #55 and 2K
Champion CB-8 and CB-15 and CB-18
Redford #1 and 2
San Bio CB-40-D-LPP

Complete CO₂ Unit-Shooter, Gasser, w/Tanks & Mixer

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Large F. E. Mold Drying Oven
Large Porbeck Mold Drying Oven
Porbeck double end Gas or Oil
Porbeck single end Gas or Oil

HEAT TREATING
Lindberg Super Cyclone
Gas Fired 48″ Dia x 60″
G.E. 30″ Dia x 36″ Single Phase Electrics

JOLT PIN LIFT
J & J 688 24 x 30 table
Davenport 34A, 36 x 46 Table
Milwaukee 1536, 32 x 38 Table
Plain Jolters, 72 x 72 Table, Cap. 8500#
Plain Stripper—15,000# Capacity

JOLT SQUEEZE PIN LIFT
International PKL14, 24″ x 24″ Table
International PK18, 24″ x 36″ Table
Milwaukee 125, 21″ x 27″ Table
Milwaukee 126, 21″ x 27″ Table
Milwaukee 145, 24″ x 30″ Table
Milwaukee 193, 19″ x 32″ Table
Osborn 712PJ, 18″ x 26″ Table

SPO 2192 (auto-cycle), 34″ x 42″ Table

JOLT ROLLOVER DRAW
Herman 40″ x 60″—10,000#
International F 16″ Draw, 28″ x 52″ Table
International G 30 x 12, 28″ x 38″ Table
J&J 918, 44″ x 54″ Table
J&J 612, 24″ x 30″ Table
SPO 508, 28″ x 30″ Table
Tabor 30″ x 40″ Table
J&J 815, 30″ x 40″ Table

JOLT SQUEEZE ROLLOVER DRAW
Osborn 332, 20″ x 36″ Table
SPO 920, 20″ sq. cyl, 20″ x 44″ Table
SPO 413D, 24″ x 24″ Table

SPO 9546, 24″ x 30″ Table

JOLT SQUEEZERS
International PJS-16″
International LJS-10″
International LJS-12″
Milwaukee 103
Osborn 275J and JW
SPO 110J
Tabor Top Squeezers
Champion JS, 10″

MATERIAL HANDLING
Hough HA Payloaders, Forklifts 4000#, 6000#, 7000#, Handling Boxes.
Roura Hoppers
1½ Yard D.C. Clam Shell
½ and 1 Yard Clamshell Buckets
Hoists, Air and Electric, All Sizes
Crane Magnets 29″, 45″, 50″, 55″

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Cupolas 2½, 4, 6, 8, 9, 10
Cupola Blowers, Various Sizes
Cupola Chargers, Skip & Swivel
Foxboro Air Wt. Controllers
Bondactor Mod. 1000
Crucible Furnaces (Stat & Tilt)
Dip Out Reverberatory
Lindberg Induction, 150#

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12″ Cleveland Tramrail

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Simpson #1½ UD, Skip, Hood
Simpson #3 open gear with skip
Simpson #2 open gear with skip
B&P #60—W or W/O multromatic
B&P #30 with skip and hood
Simpson Porto Muller
B&P Mulbaro
610 Clearfield

SAND HANDLING & CONDITIONING
Complete Overhead Sand Systems
Screenarator S, M, L
Royer NDP-NC2, Junior
American Sand Cutters, Various Sizes
Bucket Elevators
Troughing Conveyor 16″ x 34′ w or w/o magnetic pulley
Oscillating Conveyor 24″ x 30′
B&P No. 40 and 60 Preparators
Magnetic Pulleys 12 x 18 and 14 x 16

MISCELLANEOUS EQUIPMENT
Sprue Cutter
Grinders, 18″ x 24″, US No. 65, Marshke, Bridgeport
Flasks, Steel, various sizes
Flasks, Aluminum Slip
Flasks, Fremont Magnesium Slip
Jackets, Aluminum & Wopper Jaw
Core Plates—Aluminum & Transite
American Core Rod Straightener
15 HP Swing Grinder
Tumbling Barrels 36″ x 72″, Whiting, Sly
458 Chain & Trolleys
Chemical & Physical Labs
42″ Bullard "New Era" VTL lathe with side head
52″ Betts Boring Mill with two loading arms, late
American Radial Drill 14″ x 7′ arm
Cincinnati 2F Milling Machine, late

Send your requirements; our stock changes daily. WANTED! Good Surplus Equipment

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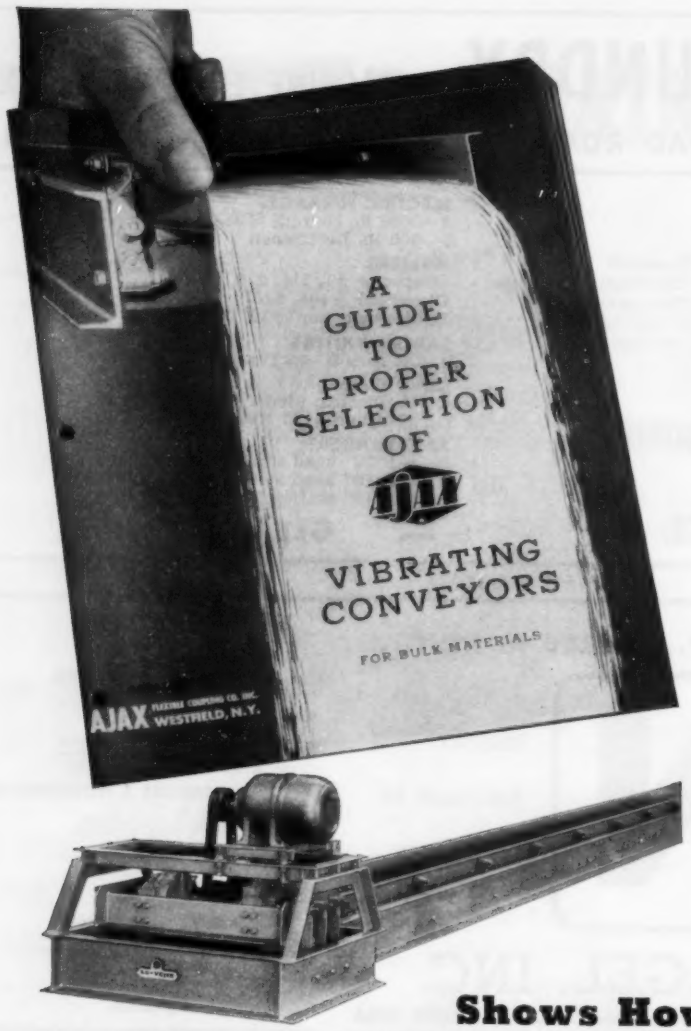

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in foundries

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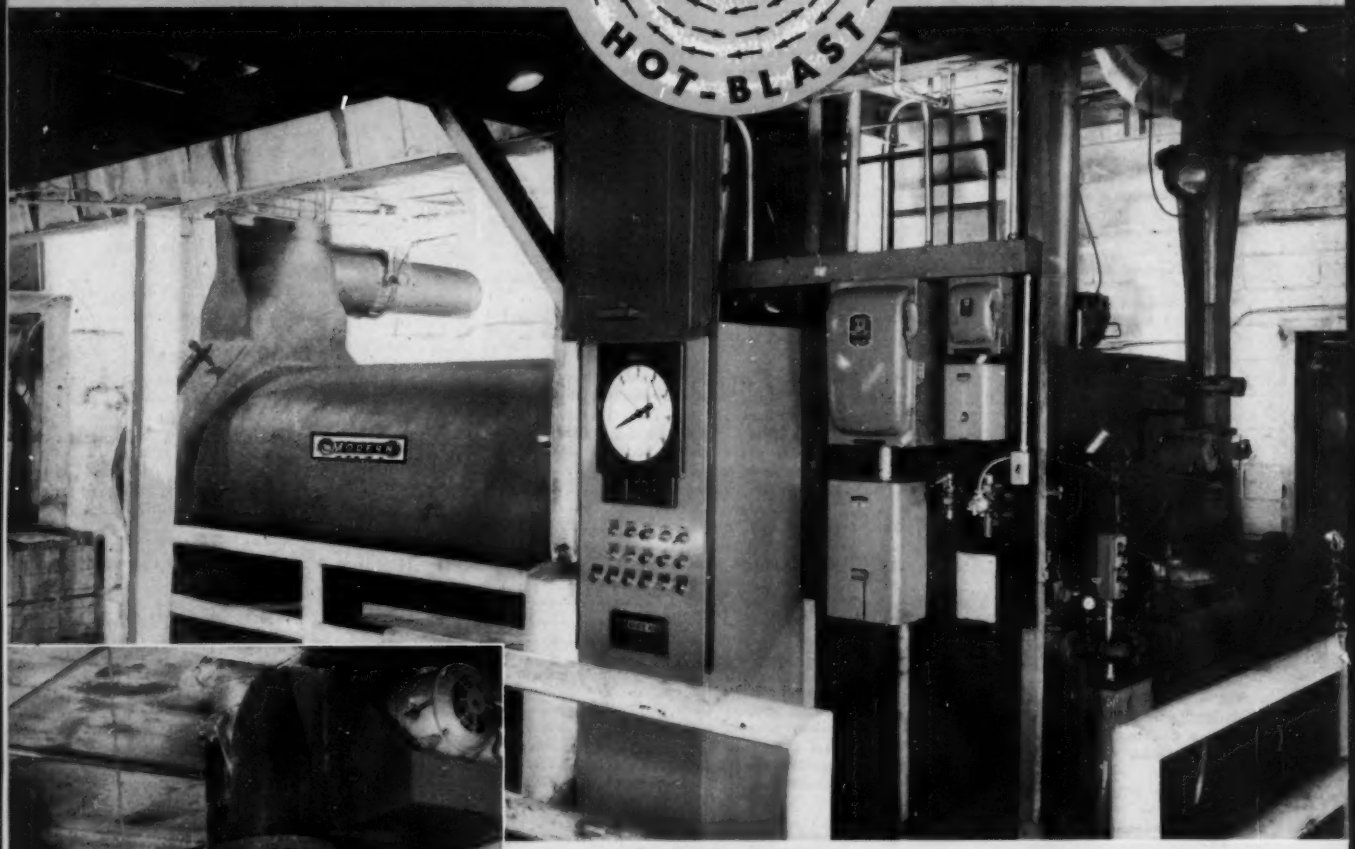
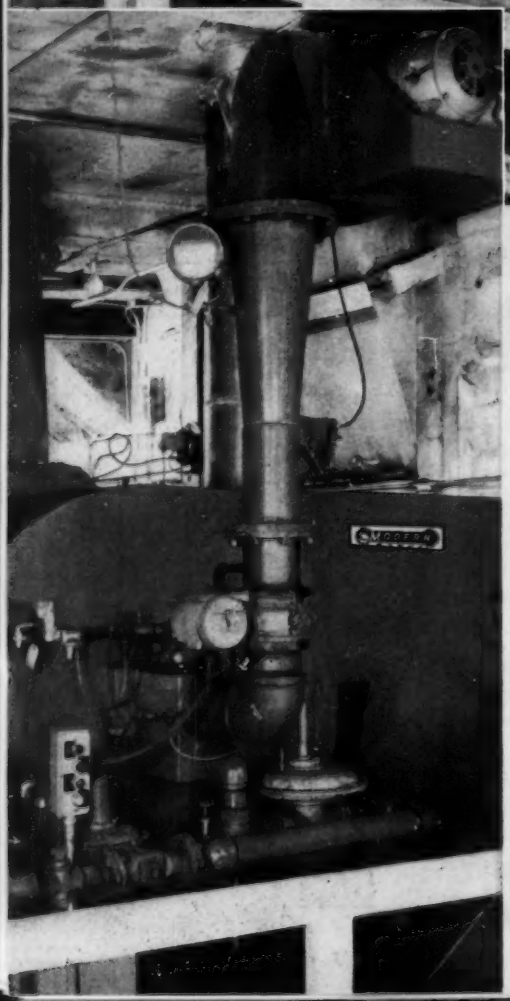
MODERN

RECIRCULATORY
Eff. to 85%
HOT-BLAST

COST CUTTING!





750° F., MODERN, hot-blast heater is supplying 7500 CFM to MODERN, externally, water-cooled cupola at Neenah Foundry Co., Neenah, Wis.

12 GOOD REASONS WHY THEY BUY...

Recirculating the products of combustion boosts efficiencies as high as 85% in MODERN, indirect-externally-fired, hot-blast heaters. The counter-flow and cross-flow principle of gas-to-air heat transfer provides a scrubbing action which results in a higher, heat-transfer coefficient. The smooth inner and outer surfaces of the tubes assure minimum pressure drop and maximum tube cleanliness. Pilot, ignition and safety equipment meets all state safety codes.

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- *Hotter iron is tapped . . .*
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- *Fewer castings scrapped . . .*
- *Lower sulfur pick-up . . .*
- *Increased melting efficiency . . .*
- *Less costly charge substitute . . .*
- *Chemistry is more uniform. . .*
- *Melting rate increased . . .*

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MODERN EQUIPMENT COMPANY
Dept. F-9
Port Washington, Wisconsin

REPRESENTATIVES IN ALL PRINCIPAL CITIES

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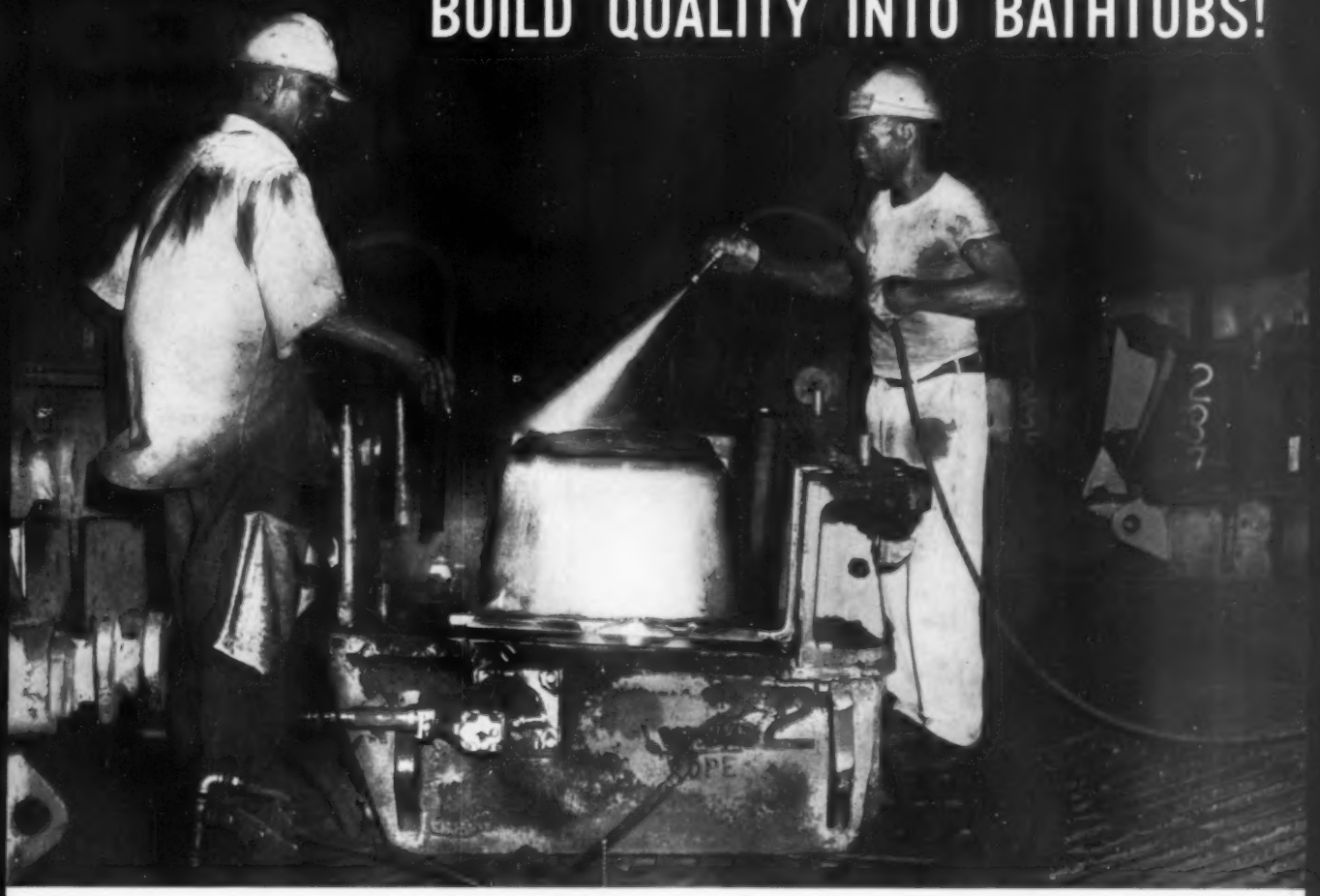

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REPRESENTATIVES IN ALL PRINCIPAL CITIES

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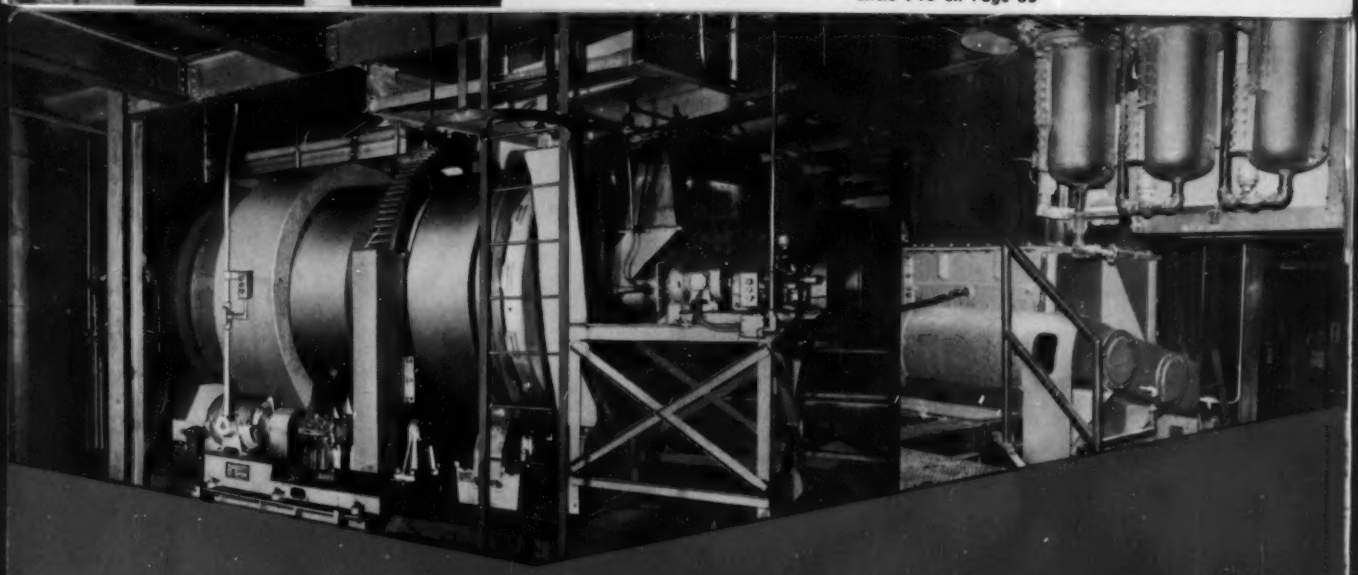

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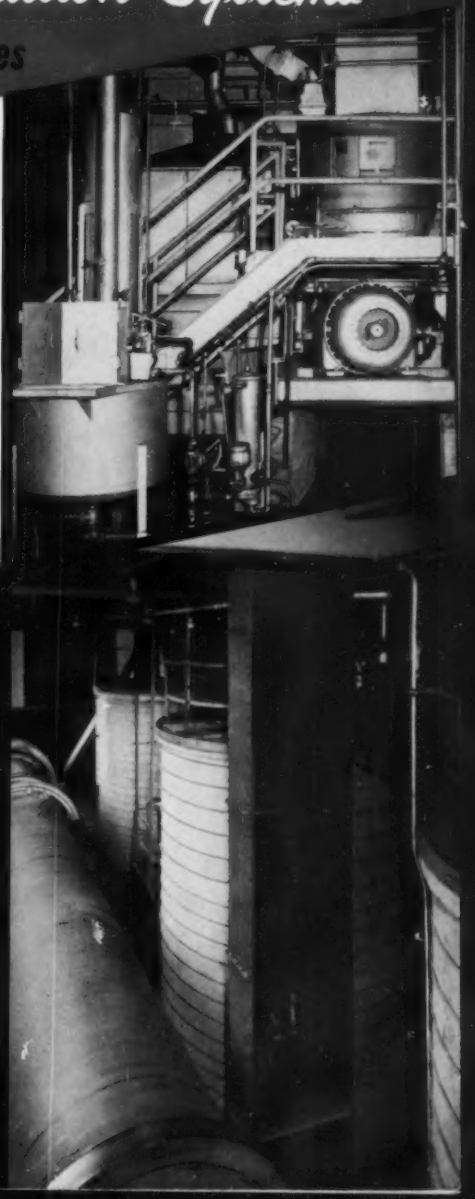

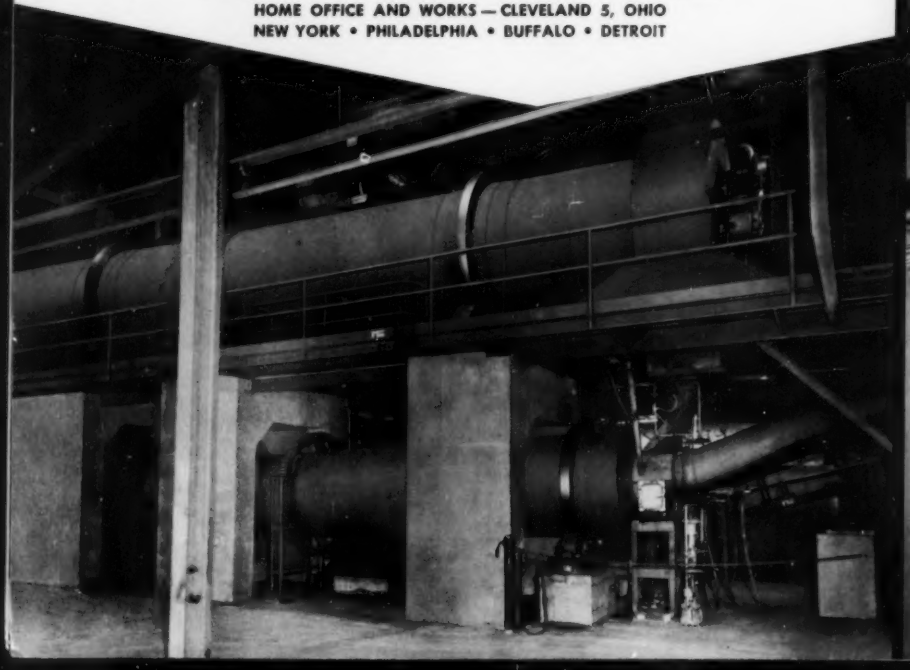

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